USER GUIDE

Matching, Linking, and Merging

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StiboSystems
MASTER DATA MANAGEMENT

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Matching, Linking, and Merging

The STEP Matching, Linking, and Merging component offers powerful functionality for identifying and handling duplicate product, entity, asset, and classification objects in STEP.

The matching, linking, and merging functionality is most commonly used for:

- Cleanup operations (during data migration, for example)
- Matching of the same item from multiple suppliers
- Matching of the same customer from different source systems
- Matching of internally enriched records with data from external data suppliers
- Consolidation of information from different systems
- Cleansing data after migrating records from various sources

Strategy for Identifying Duplicates

Before configuring the matching, linking, and merging functionality you must define what qualifies two or more objects as duplicates.

- For products, you could be looking for objects that have the same EAN number, or the same or similar manufacturer and manufacturer part number information.
- For customer data, you could be looking for people that have the same or similar names, combined with the same or similar addresses.

There are also many cases far more complex than those listed above.

When dealing with datasets of thousands or millions of objects, comparing each and every object with every other object is not a viable solution. In order to limit the number of comparisons, **Match Codes** must be generated for the applicable objects and then evaluated and matched together via a **Matching Algorithm**. The system can be configured to handle those matches in two ways: by merging matching records, or by generating **Golden Records**, which combines the data of all confirmed matching objects into one 'true' record. Based on the configuration, these matched objects can either remain in the system and link to the golden record, or get permanently merged into the golden record.

For more information on match codes and matching algorithms, see the **Matching, Linking, and Merging Elements** section of the **Matching, Linking, and Merging** documentation.

For more information of golden records, see the **Golden Record Match Actions** section of the **Matching, Linking, and Merging** documentation.

Matching, Linking, and Merging in Web UI

Several different matching, linking, and merging tasks can be completed in Web UI. See the list below for Web UI topics relevant to the Link Golden Record and Identify Duplicates solutions:

- **Potential Duplicates List** - Found in the **Web UI Setup and User Guide / Web User Interfaces** documentation.
- **Merging Confirmed Matches** - Found in the **Web UI Setup and User Guide / Web User Interfaces** documentation.
- **Configuring a Deduplication Clerical Review** - Found in the **Using a Web UI** documentation.

For a breakdown of Web UI topics relevant to the Merge Golden Record solution, refer to the **Matching and Merging in Web UI** section of the **Matching, Linking, and Merging** documentation.

Note: This list will be updated periodically as additional Web UI topics are developed.

Matching, Linking, and Merging Elements

The Matching, Linking, and Merging functionality relies on four underlying elements: Match Codes, a Matching Algorithm, an Event Processor, and an Inbound Integration Endpoint. Together, these elements can evaluate a dataset for duplicate objects and initiate necessary maintenance actions. To accomplish this, match codes are generated for objects in a dataset and the matching algorithm evaluates those match codes for potential duplicates.

How those duplicates are found and handled depends on how the matching algorithm is configured. The main three methods of handling duplicates are:

- **Identify Duplicates Match Action** - For more information, see the **Identify Duplicates Match Action** topic.
- **Link Golden Record Match Action** - For more information, see the **Golden Record Match Actions** documentation.
- **Merge Golden Record Match Action** - For more information, see the **Golden Record Match Actions** documentation.

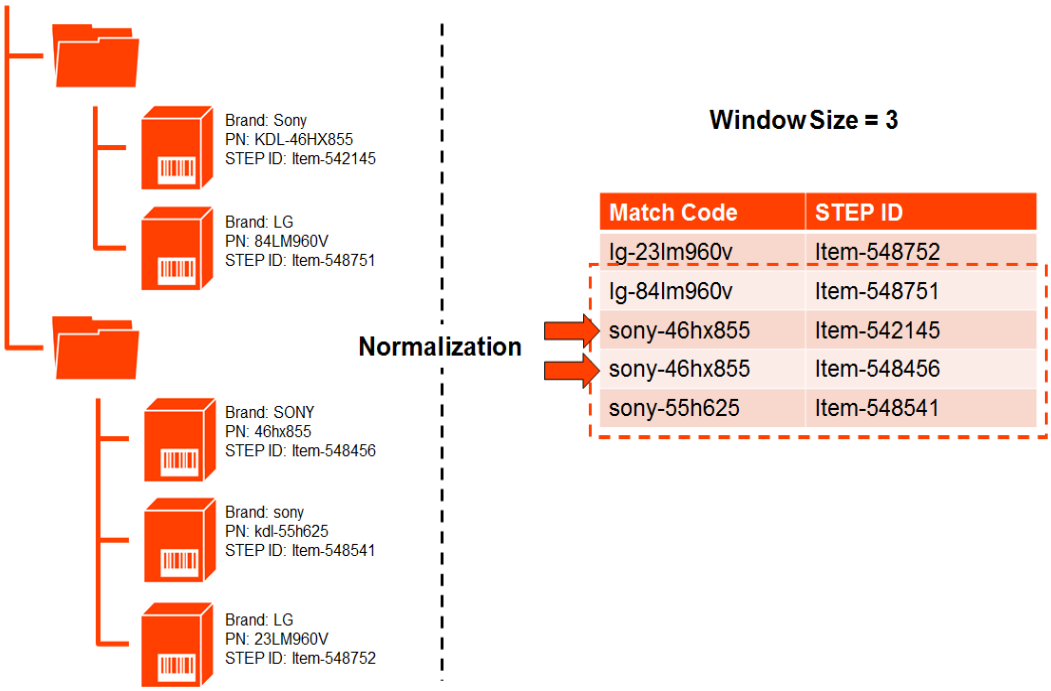
The event processor triggers events which can be acted upon by a business rule or an outbound integration endpoint.

Match Codes

A match code is essentially a string (i.e., a text) representing an object. The string is derived using either STEP functions or JavaScript (drawing upon the functionality exposed in the public Java API). As an example, a match code could be composed of the values of two attributes concatenated.

Once generated, these match codes populate an alphabetically sorted table in the system. Rather than comparing every object with every other object in the dataset, only objects with match codes close to each other in the sorted list will be compared. This dramatically limits the number of comparisons required as they are linearly proportional with the number of objects. The number of comparisons an individual object can make is based on the Window Size setting.

Example



Using the data from the image above, with a window size of '3', every product object would be compared to the object with the match code immediately prior to / following it in the list – the exception being the two products for which identical match codes are generated ('Item-542145' and 'Item-548456'). As the window size setting is for unique match codes, 'Item-542145' would be compared to both 'Item-548751', 'Item-548456' and 'Item-548541' while 'Item-548456' would be compared to 'Item-548751', 'Item-542145', and 'Item-548541'.

Disregarding that match code values can be identical, the function for calculating the number of comparisons with this approach can be approximated to:

Total comparisons required = ((Window Size -1) / 2) * Number of objects

With this approach, you have to be very careful when defining the match code. Objects with match codes that are alphabetically far from one another are not likely to be compared (unless the window size is set very high, which then defeats the purpose).

For more information on match codes, things to consider before configuring match codes, and how they are configured, see the **Configuring Match Codes** documentation.

Matching Algorithm

Match codes limit the number of comparisons that the matching algorithm has to make, and once the codes have been generated, the matching algorithm can compare objects in the dataset. Comparing two objects results in a number between 0% and 100%, indicating how similar the objects are to each other.

There are many ways to arrive at this metric. In some cases, you could only be interested in exact matches, and the algorithm would be fairly straightforward. For example, if the social security number for two customer objects is the same, then it is very likely these are duplicates and the matching algorithm should return 100% (or 0% if the numbers are not the same).

In many cases, however, you cannot work with exact matches, but instead, will have to deal with approximate matches, or a combination of exact and approximate matches. It could be that for the customer object mentioned above, you don't have a social security number available and will have to identify duplicates based on names, mail addresses, phone numbers, and street addresses. These pieces of data can have variations, even in objects that represent the same real world entity. Names and addresses could be spelled differently, middle names could be left out, abbreviations could be used in names and addresses, the customers could be registered with different phone numbers or mail addresses, and so on.

For more information on matching algorithms and how they are configured, see the **Configuring Matching Algorithms** documentation.

Event Processor

While the match code and matching algorithm define the data and handling that is needed, an event processor is required to launch the associated business rule or OIEP.

Once set up, an Event Processor can be configured to monitor the system for actionable events on specified objects and then regenerate match codes and/or run matching algorithms in response. For example, consider an object that is subject to a matching algorithm. When the match code assignment or data on that object is approved, the approval can trigger the event processor to regenerate the match code for that object and run the algorithm. Alternatively, events could be passed to the event processor via a republish business rule as part of a workflow or integration.

Event processors keep a background process log, so you can determine when events were processed and what actions were taken in response. Additionally, event processor performance measurements are available on the Statistics tab for both Matching Algorithms and Match Code configurations.

For more information on matching event processors and how they are configured, see the **Configuring Matching Event Processor** documentation.

Inbound Integration Endpoint

For the Identify Duplicates and Link Golden Record solutions, IIEPs are used to get data into the system. During the import process, the matching process can be invoked by a business rule.

For more information on configuring an IIEP for Identify Duplicates and Link Golden Record solutions, see the **IIEP - Configure STEP Importer Processing Engine** section of the **Data Exchange** documentation.

In a Match and Merge configuration, the IIEP is responsible for importing source record values, matching the source records to existing golden records, and merging the surviving source record values into the golden record. Once configured, the IIEP will respond to incoming data, and will evaluate the inbound records against any existing golden records in STEP. If matches are found, those records will be merged together, and any records that fall within the clerical review threshold will be automatically initiated into a clerical review workflow (after being processed by the event processor).

For more information on configuring an IIEP for Merge Golden Record solutions, see the **IIEP - Configure Match and Merge Importer** section of the **Data Exchange** documentation.

Golden Record Match Actions

Of the three Matching, Linking, and Merging match actions, both Link Golden Record and Merge Golden Record utilize golden records to ensure deduplication of objects in STEP. Instead of performing a simple merge on duplicate objects, a matching algorithm can be configured to create golden records using the most reliable data from those objects. How these two match actions create golden records differ, however, and both solutions fulfill different business requirements.

Some fundamental differences include:

- The nature of the golden records themselves, including how they are handled and the significance they hold in the system. With a Link Golden Record solution, golden records represent the source objects and should never be maintained manually. In this sense, these gold records are temporary, and could disappear at any time based on changes to their source records. With a Merge Golden Record solution, records confirmed as duplicates are merged into one surviving golden record, and the contributing records are deactivated. These golden records *can* be maintained directly.
- The nature of the source information. With a Link Golden Record solution, source records contribute values to the golden record, and remain in the system as separate objects in STEP. With a Merge Golden Record solution, there is no source object concept. Source record values are merged into golden records and no separate source objects are stored in STEP.
- Merge Golden Record is only to be used with entities.

Link Golden Record Match Action

When using the Link Golden Record Match Action, any duplicate objects that contribute data to the golden record are called 'Source Objects', and are referenced by the golden record. Source objects are unchanged by the matching and linking process.

After a matching algorithm configured with this match action has been applied, a source object will always have a golden record referencing it. For example, if you have 100 source objects and find that two of the objects are duplicates, running a matching algorithm creates 99 golden records. 98 of the golden records will have a reference to a single source object each, while the last one will reference two source objects.

Note: Any golden record that only references a single object is called a 'singleton'.

Because golden records represent the source objects, their data should never be maintained manually. Furthermore, golden records are updated every time the matching logic is applied, and may be deleted or changed to point to other objects as part of the process. Given their temporary nature, IDs of golden records should have limited significance in STEP and in external systems. It is recommended that golden records be considered temporary representations of the source objects in the dataset.

In the diagram below, a golden record is created based on two source objects:

With this functionality, only golden records will be made available to external systems – not a mixture of golden records and source objects.

Note that there may be times when more than two objects are identified as duplicates. Since the system only compares two objects at a time, transitive closure is used:

If A = B, and B = C, then A = C

Had A, B, and C been source objects, they would all have been referenced from the same golden record.

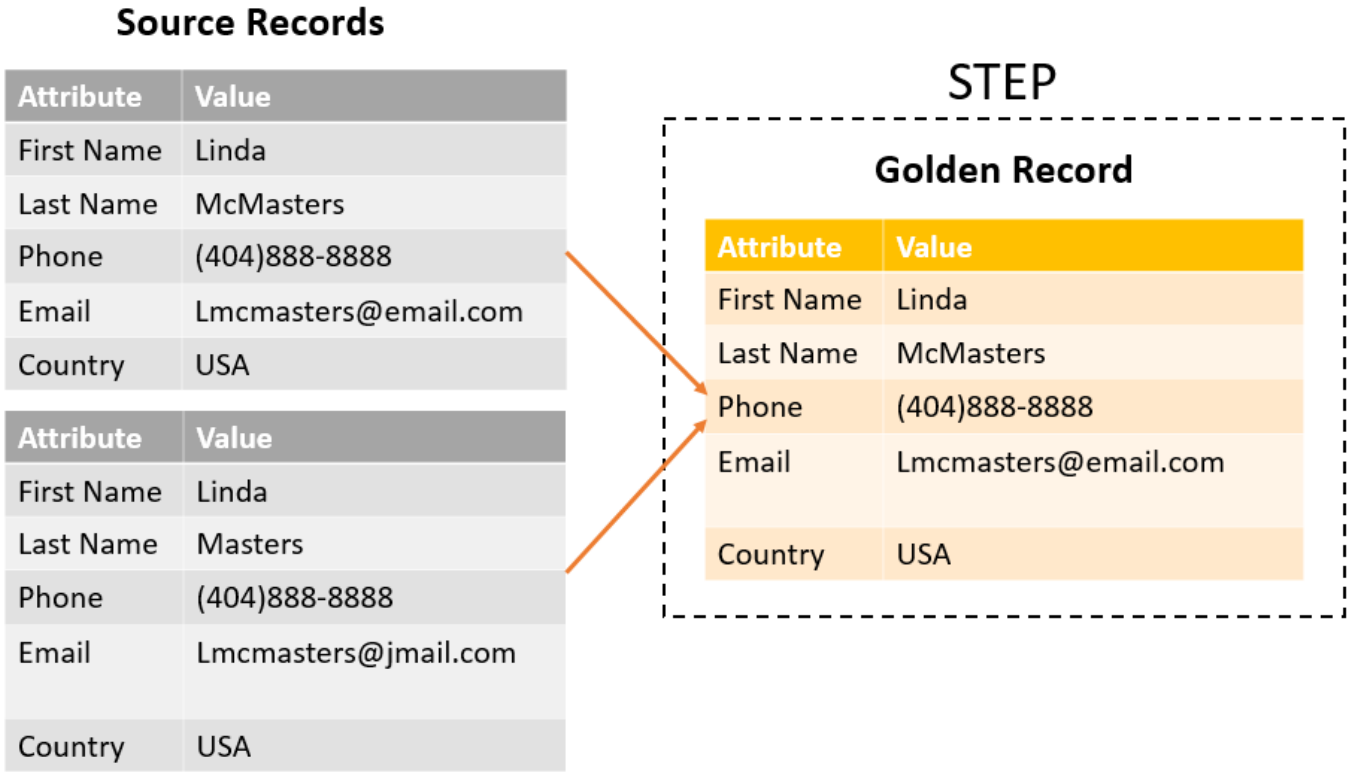
For more information of golden records and their configuration options, see the **Configuring Golden Records** documentation.

Merge Golden Record Match Action

A matching algorithm configured with the Merge Golden Record match action evaluates potential duplicates as they come in from source systems, and matches them against existing golden records in STEP. If incoming records are found to be a match, the values of these records are merged into the corresponding golden records, and the source records are *not* stored as unique objects. During the merge, the source data is evaluated via survivorship rules configured on the corresponding matching algorithm, and the surviving data is then merged into the golden record. If no existing golden records are found new ones are created.

Important: Merge Golden Record is only available for entities.

In the diagram below, a golden record is created based on two source records that reside outside of STEP:



If any matched records fall within the clerical review threshold, these records are automatically initiated into a clerical review workflow. When golden records are merged through this process, any record not designated as the survivor will be deactivated. Any records excluded from the merge will receive a 'Confirmed Non Duplicate' reference.

Important: STEP does not support running merge imports on several applications servers in a cluster for the same object type.

For more information of golden records and their configuration options, see the **Configuring Golden Records** documentation.

Matching, Linking, and Merging Configuration

Considering the robust nature of the matching, linking, and merging functionality, configuration can be complex. Before beginning the configuration it is necessary to develop a complete deduplication strategy. Forming a strategy requires an intimate knowledge of the data in question. Data profiles are a great way to examine your data and can aid in developing your strategy. Ultimately, your strategy could be:

- Identify duplicates in order to address them (via the Matching component)
- Keep duplicates but identify them by linking them to a golden record, for example, the same product from different suppliers (via the Match and Link component)
- Eliminate duplicates but keep a golden record of the 'best' data - for example, the same person but with different email addresses (via the Match and Merge component)

For more information about deduplication strategies, see the **Configuration Example - Basic** and **Configuration Example - Advanced** sections of the **Matching, Linking, and Merging** documentation.

For more information about data profiles, see the **Data Profiling** documentation.

Once a strategy has been developed, users will have to configure underlying attributes for use in the configuration, as well as potentially writing JavaScript for dictating the logic of the matching algorithm. Typical configuration steps include:

- Configuring the Component Model(s)
- Configuring the Setup Group
- Configuring the Match Codes
- Configuring the Matching Algorithm
  - May include configuring Golden Records
- Configuring the Inbound Integration Endpoint
- Configuring the Event Processor
  - Including Matching Algorithm / Match Code maintenance tasks

Matching, Linking, and Merging Component Model Configuration

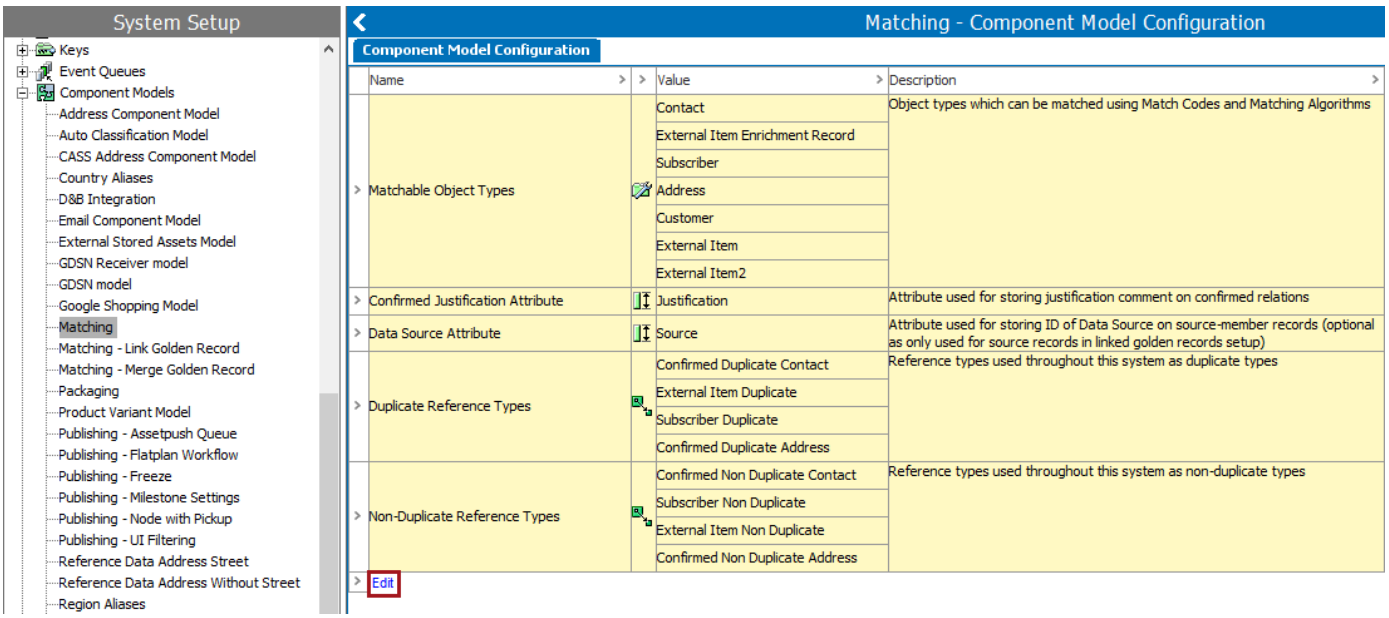
Before match codes can be generated and matching algorithms applied, the **Matching Component Model** must be configured. The component model determines which objects, attributes, and references are relevant to your configuration, and how they apply. There are three component models relevant to Matching, Linking, and Merging: 'Matching', 'Matching - Link Golden Record', and 'Matching - Merge Golden Record'.

All relevant object types, attributes, and references must be created and instantiated into the tree before they can be mapped to the component model.

Matching Component Model

The Matching component model defines all objects types that are allowed to be matched.

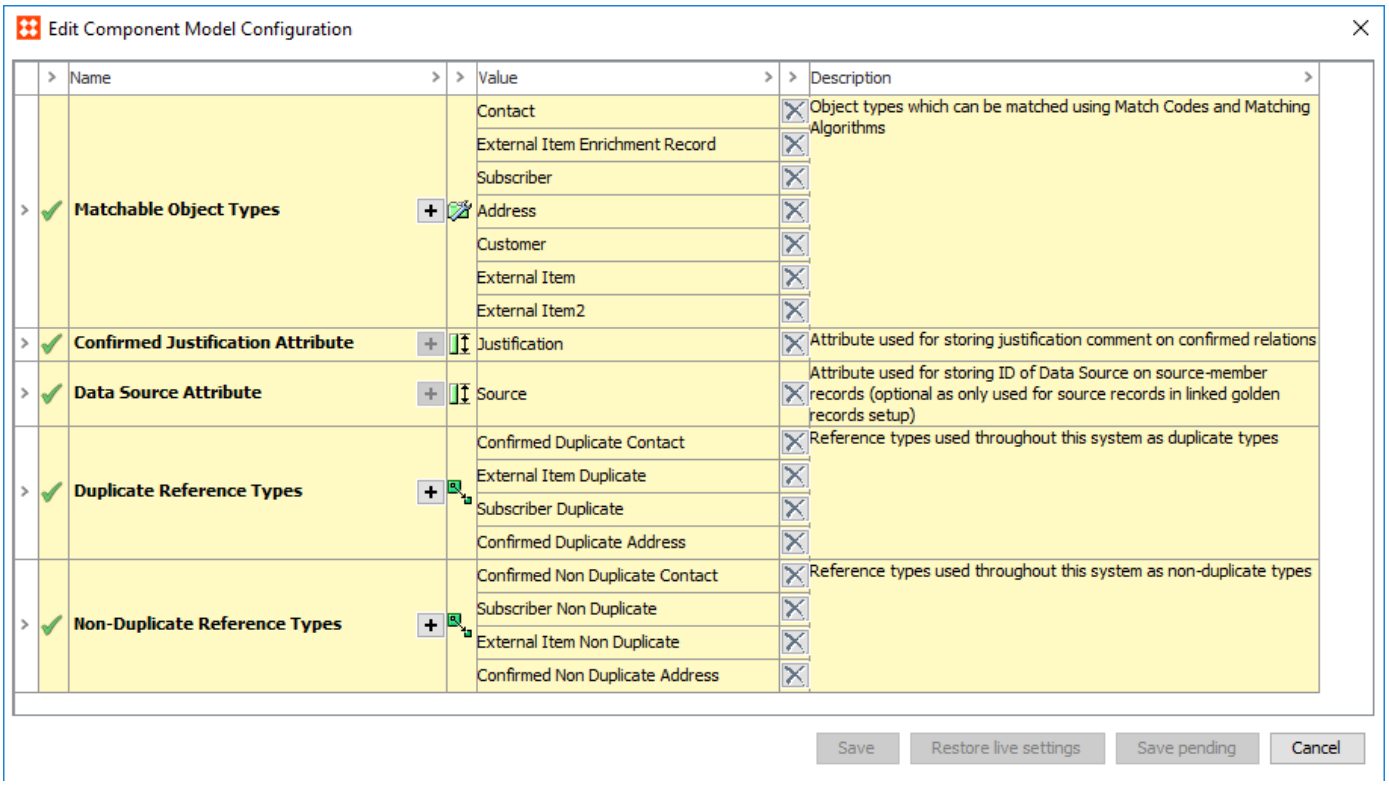
1. In **System Setup**, expand 'Component Models', and click on the 'Matching' node.
2. On the 'Component Model Configuration' tab, click the **Edit** link.



3. Click the 'plus' button for the relevant component aspect to display the selection dialog, and then choose to add an object, attribute, or reference:
   - **Matchable Object Types** – Select the object types that need to be matched. Only the object types configured can be used as object types for match codes. On objects of these types, the 'Matching' tab is automatically enabled. The 'Matching' tab shows match code values, potential duplicates, and confirmed relations for the selected object.

Note: Golden Record object types configured on the other two Matching, Linking, and Merging component models must be configured.

- **Confirmed Justification Attribute** – Select a description attribute that is valid for all reference types specified in the 'Duplicate Reference Types' and 'Non-Duplicate Reference Types' fields. This attribute stores a description explaining why two objects are marked as duplicates or non-duplicates. This attribute value is defined by a data steward during clerical review.
- **Data Source Attribute** – Select one or more description attributes that are valid for all source object types specified in the 'Source Object Types' field. This attribute contains the source ID of the source objects. If you select more than one attribute in this field, then exactly one of these attributes must be valid per source object type selected in the 'Source Object Types' field. This field is only required for Link Golden Records solutions with Trusted Source survivorship rules configured.
- **Duplicate Reference Types** – Select one or more reference types to be used to store the manually maintained confirmed duplicate references. These references store the reason for confirming two objects as duplicates as specified in the attribute selected in the 'Confirmed Justification Attribute' field. All the selected reference types must have exactly one valid attribute from the 'Confirmed Justification Attribute' field. Only the duplicate reference types you select can be used as 'Duplicate Type' on a matching algorithm. In a typical scenario, you will have different duplicate reference types for different matching algorithms. If you reuse duplicate reference type between algorithms, then the confirmed duplicates will be reused between those algorithms as well.
- **Non-Duplicate Reference Types** - Select one or more reference types used by the system for storing the manually maintained confirmed non-duplicate references. These references store the reason for confirming two objects as non-duplicates as specified in the attribute selected in the 'Confirmed Justification Attribute' field. All the selected reference types must have exactly one valid attribute from the 'Confirmed Justification Attribute' field. Only reference types selected can be used as 'Non-Duplicate Type' on a matching algorithm. In a typical scenario, you will have different duplicate reference types for different matching algorithms. If you reuse non-duplicate reference type between algorithms, then the confirmed non-duplicates will be reused between those algorithms as well.



Click the 'X' button to remove the relevant object, attribute, or reference from the component model.

A green check mark will appear if the applicable row has a valid configuration.

4. Click **Save** to save changes.

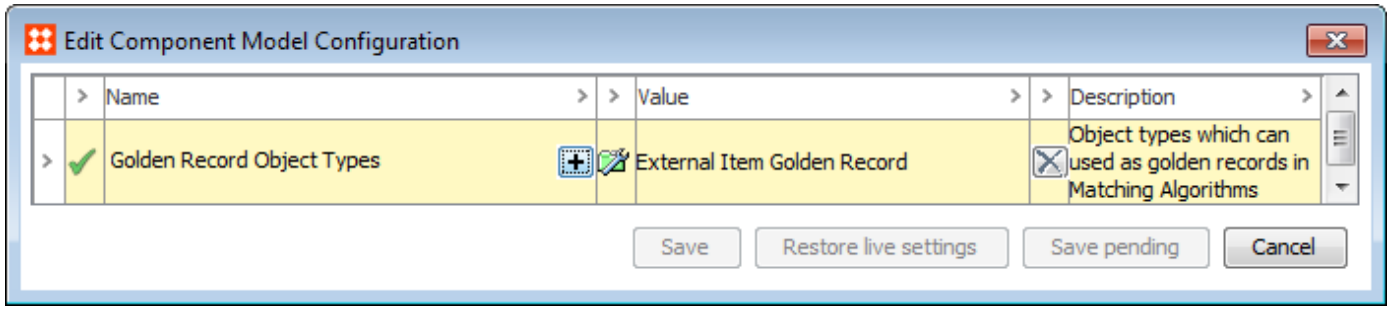
Note: If you need to navigate away from the configuration dialog and some of the rows are not yet valid (they have an 'X' instead of a check mark), click **Save pending** to save your work.

Matching - Link Golden Record Component Model

The Matching - Link Golden Record component model lists all the golden record object types applicable to the Link Golden Record solution. Golden record object types applicable to the Merge Golden Record solution should not be listed.

1. In **System Setup**, expand 'Component Models' and click on the 'Matching - Link Golden Records' node.
2. On the 'Component Model Configuration' tab, click the **Edit** link.
3. Click the 'plus' button in the 'Golden Record Object Types' field, and in the selection dialog, choose the object types you want to use for golden records in the system. Only the object types that you select can be used as golden records for Link Golden Record configurations. Furthermore, on objects of these object types the Golden Record tab is automatically enabled. The Golden Record tab shows the golden record together with its member records.

Note: The chosen object type should have all the same attributes and references valid for it as the source object type.



Click the 'X' button to remove the relevant value from the component model.

A green check mark will appear if the component model has a valid configuration.

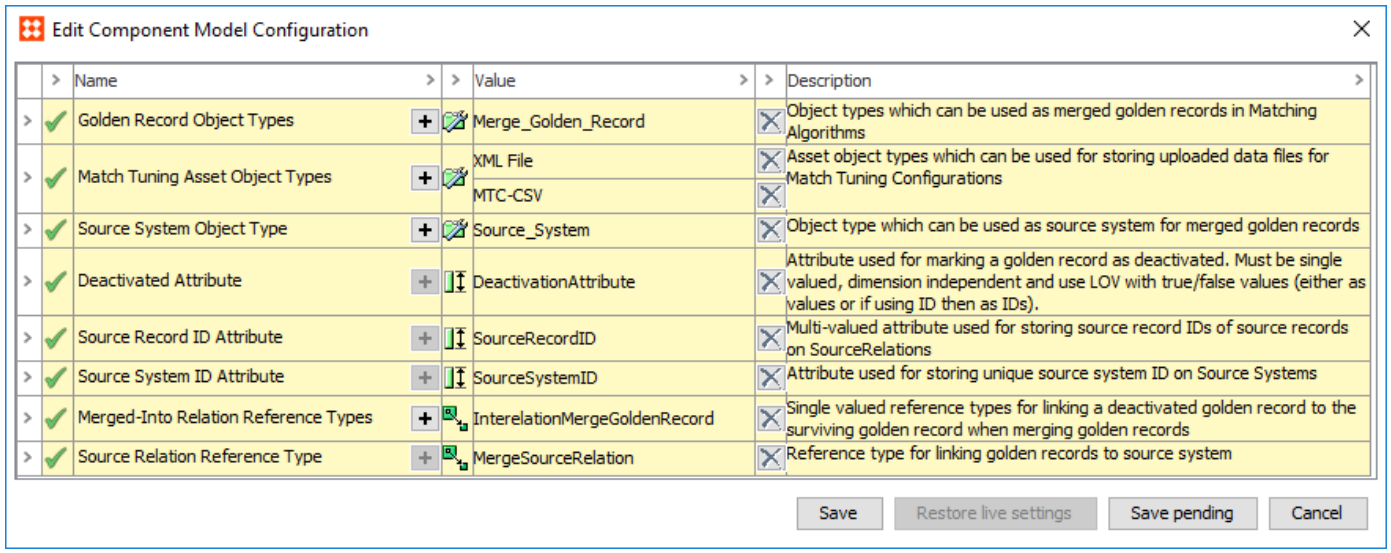
4. Click **Save** to save changes.

Note: If you need to navigate away from the configuration dialog and the component model is not yet valid (it has an 'X' instead of a check mark), click **Save pending** to save your work.

Matching - Merge Golden Record Component Model

The Matching - Merge Golden Record component model lists all the golden record object types applicable to the Merge Golden Record solution, along with a number of other vital components. Golden record object types applicable to the Link Golden Record solution should not be listed.

1. In **System Setup**, expand 'Component Models' and click on the 'Matching - Merge Golden Records' node.
2. On the 'Component Model Configuration' tab, click the **Edit** link.



3. Click the 'plus' button for the relevant component aspect to display the selection dialog, and then choose to add an object, attribute, or reference:

   - **Golden Record Object Type** – Select the object types that can be used as golden records in the system. Only the object types that you select can be used as golden records for Merge Golden Record configurations.
   - **Match Tuning Asset Object Types** – Select the asset object types that can be used for storing uploaded data files for Match Tuning configurations.
   - **Source System Object Type** – Select the object type that can be used as source system. This source system is referenced by golden records to signify where the record originated.
   - **Deactivated Attribute** – Select the attribute that is used for marking a golden record as deactivated.
   - **Source Record ID Attribute** – Select the attribute that is used for storing the IDs of source records on golden record objects. This attribute must be multi-valued.
   - **Source System ID Attribute** – Select the attribute this is used for storing unique source system IDs on their respective source system objects.
   - **Merged-Into Relation Reference Types** – Select the reference type(s) that link deactivated golden records to surviving golden records during a merge. This must be a single valued reference type.
   - **Source Relationship Reference Type** – Select the reference type that links golden records to source system objects.

   Click the 'X' button to remove the relevant value from the component model.

   A green check mark will appear if the component model has a valid configuration.

4. Click **Save** to save changes.

Note: If you need to navigate away from the configuration dialog and the component model is not yet valid (it has an 'X' instead of a check mark), click **Save pending** to save your work.

Configuring a Match Code and Matching Algorithms Setup Group

Match codes and matching algorithms are first class objects in **System Setup**, living below 'Setup Groups' in the workbench. In order to create new match codes and matching algorithms, however, a setup group must exist to house them.

On a system where the setup is not in place, first define a new setup group object type, make match codes and matching algorithms legal children, and then create an instance of the setup group object type in the System Setup.

For more information, see the **Setup Group** section of the **System Setup / Super User Guide** documentation.

Configuring Match Codes

Before configuring match codes there are several things to consider:

- Closely examine the data before configuring a match code. The data profiling tool can provide a lot of valuable information, and if you are planning to use a specific attribute in the match code, always check to which degree the attribute is populated – if values are missing on a lot of objects, it is likely not a good candidate, or at least should not be used alone, as objects with 'empty' match codes will not be included in the database table.
- When working with match codes composed from several pieces of data, always put the most significant data first. For instance, if deduplicating address objects, put the ZIP code before street and street number, as ZIP codes are geographic, standardized, and mutually exclusive – which most effectively separates your addresses into discrete objects.
- Be sure to normalize the data used in match codes. If, for instance, a manufacturer name is often abbreviated, your match code definition should handle this so that the name is represented the same way in the match codes, regardless of whether it is abbreviated on the source object or not.
- The match code can be just a single piece of data like an EAN number. Furthermore, if you are only interested in comparing objects that have identical EAN numbers, a Window Size of 1 can be used. This means that only objects with identical Match Code values will be compared.
- Several match codes can be generated per source object. STEP functions can resolve to a list of multiple match codes, and in JavaScript, an array can be returned. In both cases, each element will be a separate match code. As a simple example, this could be useful if you were to identify duplicates among customer entity objects, each having a name and an address attribute. The match code could be a concatenation of address and name, but with this approach, you would not be able to find duplicates for customers who have moved, as the match codes would likely be placed too far from each other. Instead, each object could be represented with two match codes: one for 'Name' and one for 'Address', meaning that the objects could be compared both due to having similar names – and having similar addresses (a hardcoded prefix should be added first to prevent comparisons across the two domains).
- Ideally, you should generate match codes that allow you to perform matching with a Window Size of 1, but where there are still not too many objects that share the same match code.

Note: Some of the considerations listed may not be relevant for all solutions.

For more information on match codes, see the **Matching, Linking, and Merging Elements** documentation.

For more information on data profiling, see the **Data Profiles** section of the **Data Profiling** documentation.

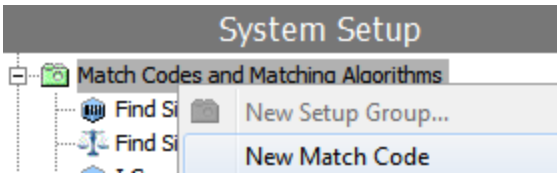
For the automated process as part of an embedded matching algorithm, see the **Configuring a Match Code Generator** topic in this documentation.

For the manual process, see the **Configuring a Manual Match Code** topic in this documentation.

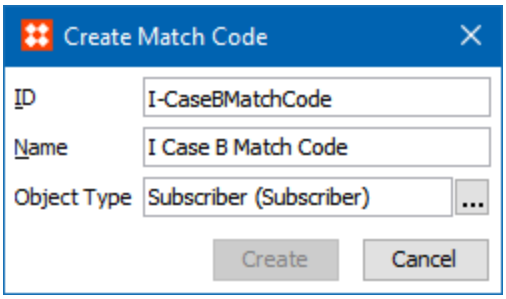
Configuring a Manual Match Code

The following is the process to manually creating a Match Code for Matching that can only be used for Matching Algorithms that have been created without the Embed Match Code checkbox selected. For the automatic process, see the **Configuring a Match Code Generator** topic in this documentation.

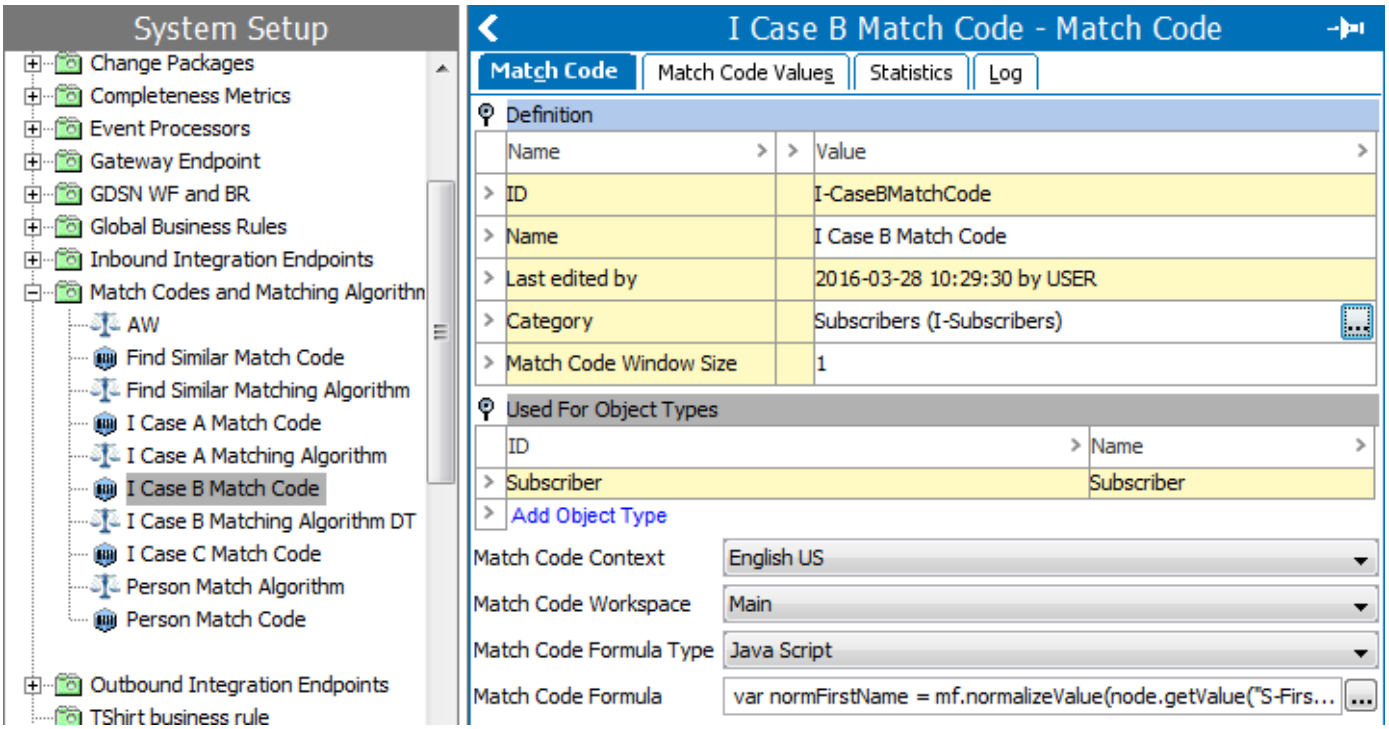
1. In **System Setup**, right-click the node configured to house match codes and select 'New Match Code'.



2. In the 'Create Match Code' dialog, define an ID and name for the match code, specify an object type for which this match code applies, and click **Create**. Additional object types can be identified in the Match Code editor (see details below).



3. On the new Match Code editor, navigate to the 'Match Code' tab and click the ellipsis button (...) in the 'Category' field. In the selector that appears, select a node to indicate which objects will have match codes generated.



4. In the 'Match Code Window Size' field, specify the window size to be used by the matching algorithm.
5. If additional object types are required, in the 'Used For Object Types' section, use the **Add Object Type** link and selector to identify more object types for the match code.
6. In the 'Match Code Context' field, specify in which context to run the match code formula. This is only required if the data is dimension dependent. By default, the current context will be selected.
7. In the 'Match Code Workspace' field, specify in which workspace to run the match code formula. By default, Main workspace will be selected.
8. In the 'Match Code Formula Type' field, specify 'Java Script' or 'Calculated' as the format
9. In the 'Match Code Formula' field, then click the ellipsis button (...) to open up the formula editor and add your match code formula.

Binds for Match Code Formulas

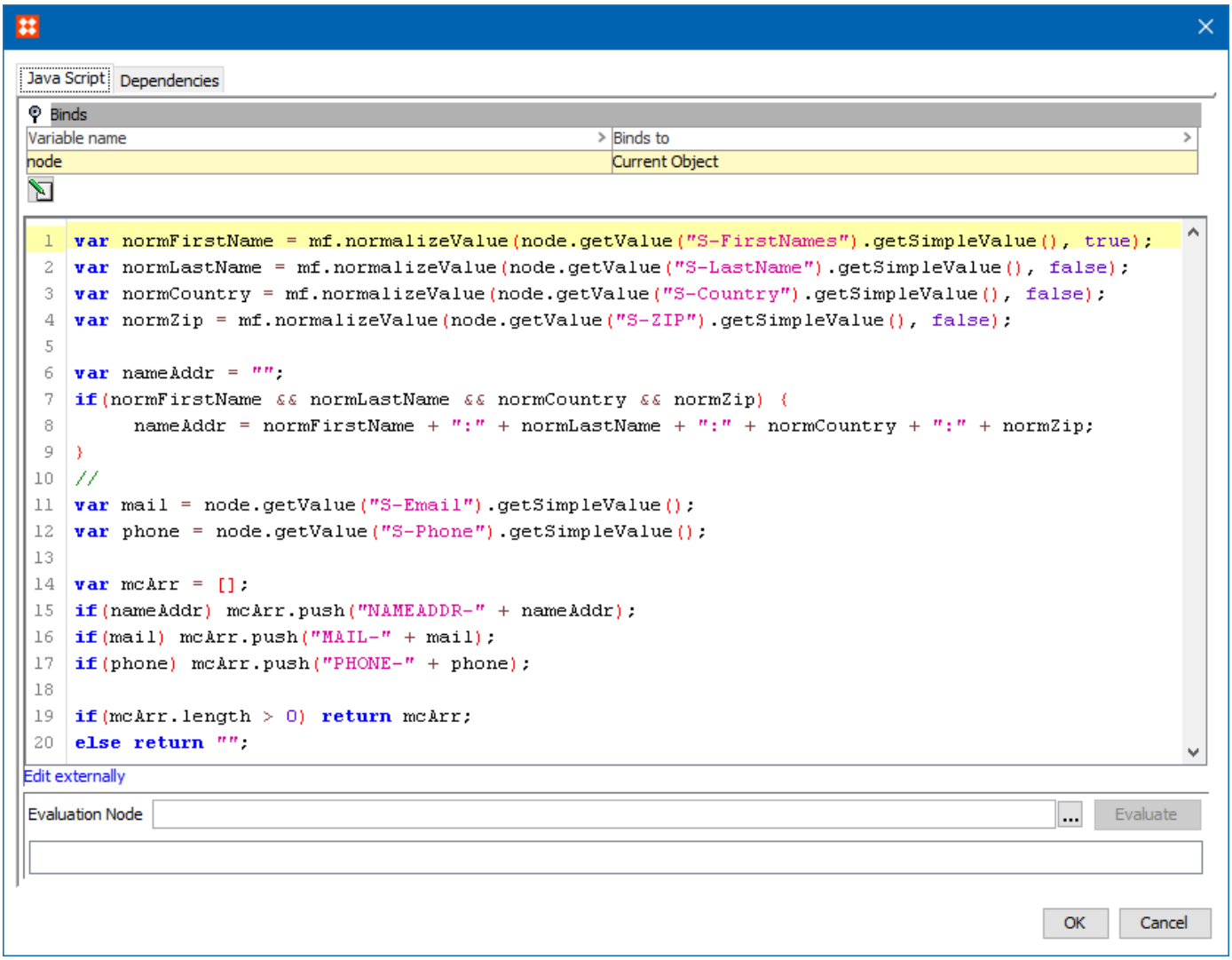
It is also possible to make use of attributes and values that are created offline, by binding them in the match code formula. This is used in cases of offline matching or matching records on import. Once inside the 'Match Code Formula' editor, open the 'Binds' flipper, and click the 'Edit Binds' button. You can declare variables and bind them to a variety of STEP elements / objects, as determined by the selected formula type.

JavaScript Match Code Formula

When using JavaScript, the current object should be bound to a variable. The ultimate goal should be to return the match code value of an object from the JavaScript. If a string is returned, it will be used as a match code value. If a JavaScript array is returned, all values in the array will be used as match code values for that object. Additional

utility functions for match codes can be accessed by binding 'Matching Functions' to, for example, the context variable in JavaScript or by binding 'Lookup Table Home' to, for example, 'lth':

Method	Description
`context.soundex('Stibo')`	Returns the Soundex. For more information, see **Text Functions** in the **Calculated Attributes** documentation.
`context.metaphone3('Stibo')`	Returns the primary value for the Metaphone 3. For more information, see **Text Functions** in the **Calculated Attributes** documentation.
`context.metaphone3alternate('Stibo')`	Returns the alternate value for the Metaphone 3. For more information, see **Text Functions** in the **Calculated Attributes** documentation.
`lth.getLookupTableValue('<asset-id>', 'LookupValue')`	For more information, see the **Transformation Lookup Tables** topic in the **Resource Materials** online help.



Calculated Attribute Match Code Formula

When defining the formula via the calculated attribute language, all functions are available. An object's match code value can be a single string derived from the value of the formula, or it can be a list where all the values in the list are used as match code values for that object.

Below is an example of a simple STEP Function:

The Match Code value for each object will be a concatenation of the value for a "Manufacturer" Attribute, the string ":" and the value for a "ManufacturerPartNumber" Attribute. The Manufacturer value is normalized via a Transformation Lookup Table with ID "ManufacturerNormalization."

```
concatenate(
    replacevaluebylookup("ManufacturerNormalization", value("Manufacturer")),
    ":",
    value("ManufacturerPartNumber")
```

```
)
```

If instead you wanted to return two Match Code values for each object, one for the Manufacturer and one for Manufacturer Part Number, each prefixed with either "MAN-" or "MPN-" could be done as follows (this example is without any normalization):

```
listconcatenate(
    concatenate("MAN-", value("Manufacturer")),
    concatenate("MPN-", value("ManufacturerPartNumber"))
)
```

The reason for adding a prefix is to avoid comparing objects where their Match Code values are from completely different domains, where at all possible.

Notice that in the examples above only rudimentary normalization is applied and nothing is done to handle cases where values are missing. Since we would typically not want Match Code values only consisting of the hardcoded prefixes, below shows how checks for empty values could be added to the last example:

```
{
    man:= value("Manufacturer"),
    mpn:= value("ManufacturerPartNumber")
}
listconcatenate(
    if(len(man)!=0, concatenate("MAN-", man), ""),
    if(len(mpn)!=0, concatenate("MPN-", mpn), "")
)
```

For more information on the available STEP functions, see the **Calculated Attribute Functions** section of the **Resource Materials** online help.

Configuring a Match Code Generator

Databases can contain an incredible amount of data. To match duplicate records for the purpose of attaining data fidelity requires insight drawn from often expansive data sets. Due to the complexity of these databases, creating the right method to match duplicate records requires to not only understand their data at a granular level but also to create and apply a solution that can account for the data's inherent complexity.

To overcome these obstacles, Match Code generators are pre-configured solutions that create the most effective way of collating data records for similarity comparisons. The following process will configure a Match Code generator based on email addresses.

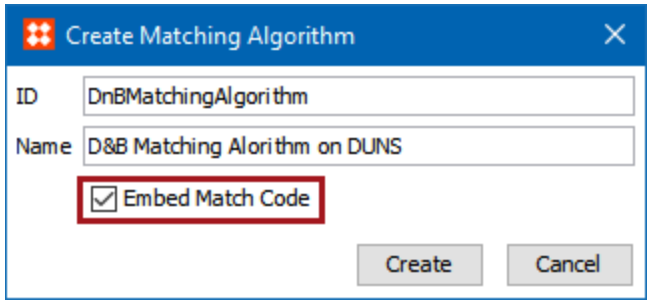
Prerequisites

To successfully implement a Match Code generator, users must have the correct permissions. For more information, see the **Privilege Rules** topic in the **System Setup / Super User Guide** documentation. This topic also assumes a familiarity with Matching records. For more information, see the **Matching, Linking, and Merging** documentation.

Configuration

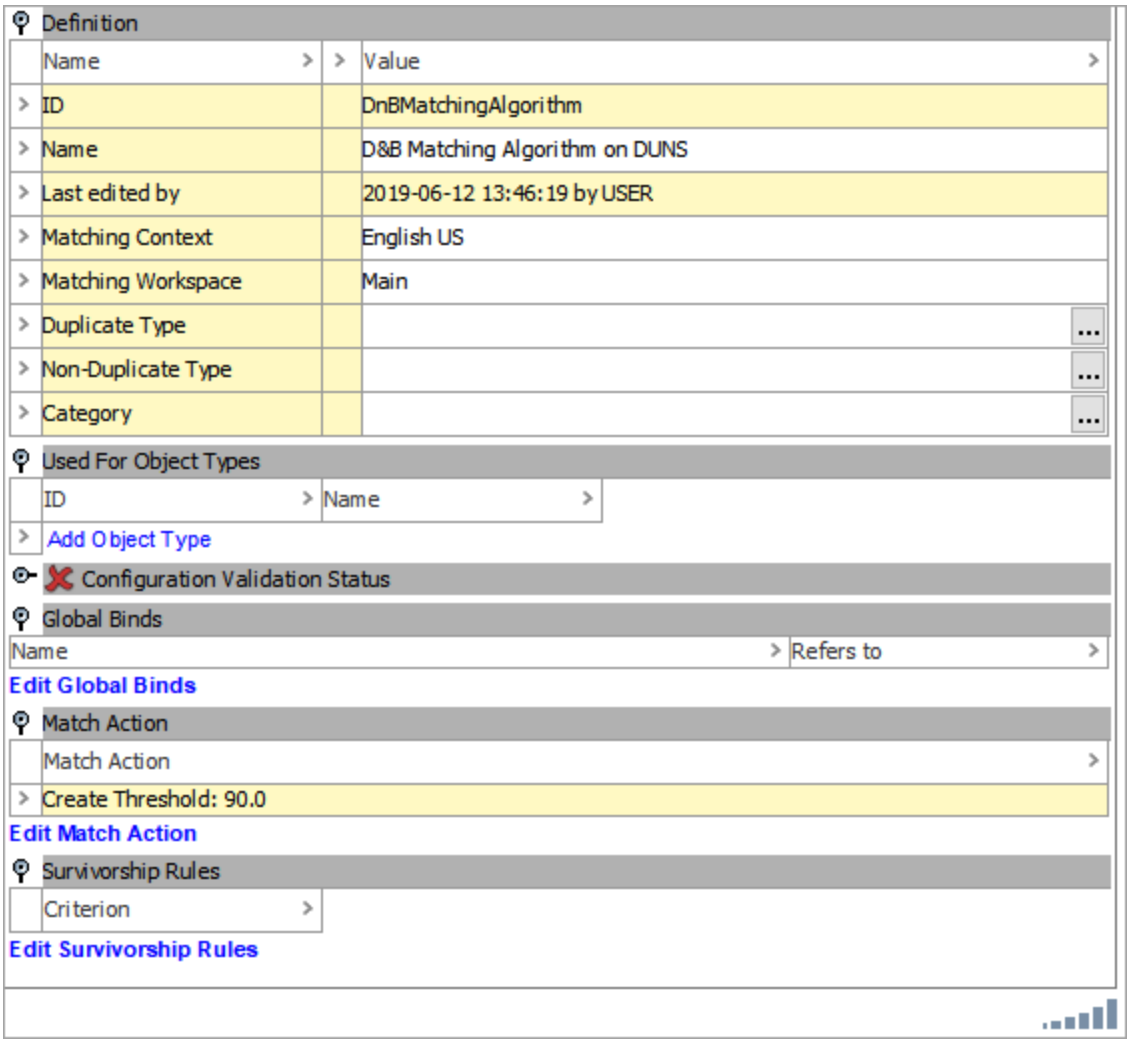
The following configurations to set up the Match Code Generators are performed in the workbench.

1. From **System Setup**, create a new Matching Algorithm by right-clicking on a valid parent node. By default, the 'Embed Match Code' checkbox is selected.

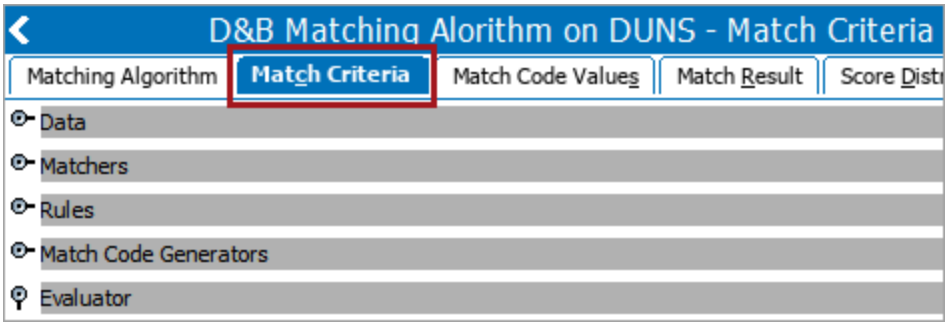


Note: Once a matching algorithm is created, it cannot be changed to allow or disallow embedded match codes. In other words, however it is created is how it will always function.

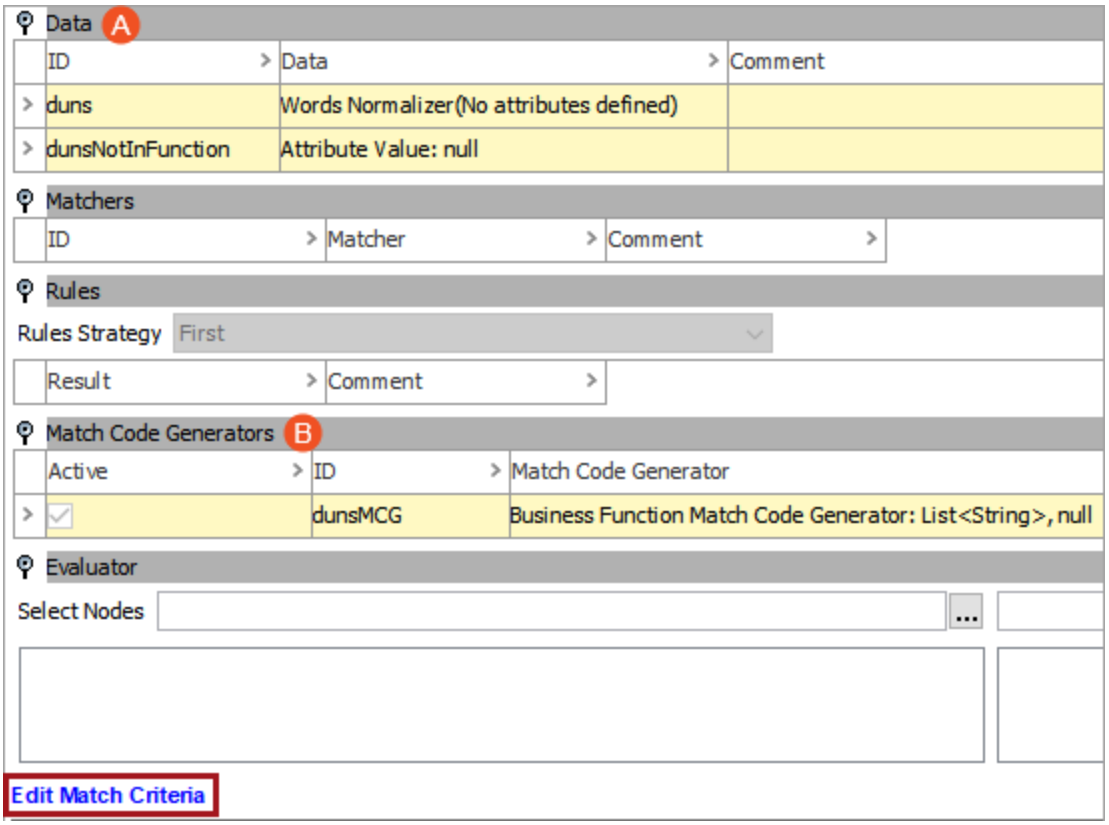
2. Once created, the Matching Algorithm with embedded match codes needs to be configured. First, on the Matching Algorithm tab, configure the fields as needed. For more information, on configuring these fields, see the **Configuring Matching Algorithm** topic in this documentation.



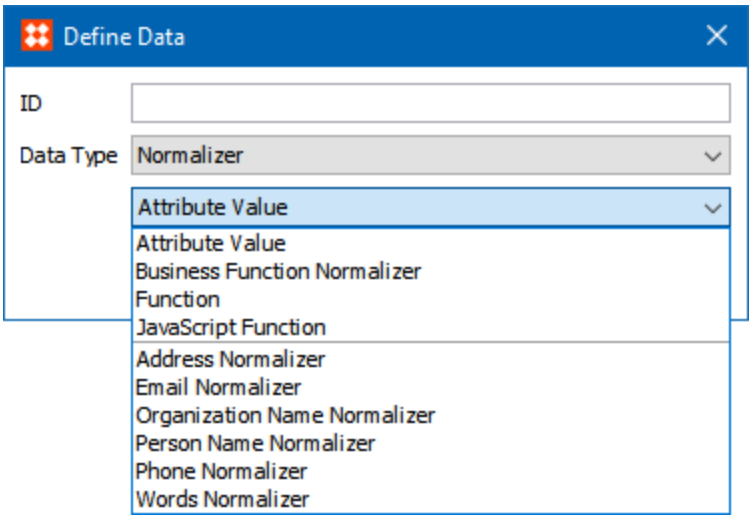
3. Once the Matching Algorithm is configured, select the Match Criteria tab. A blank matching criteria will display.



4. On this tab, there are a few sections that need to be populated. The highlighted letters in the following screenshot are for reference purposes. Select the 'Edit Match Criteria' link to open the Decision Table dialog.

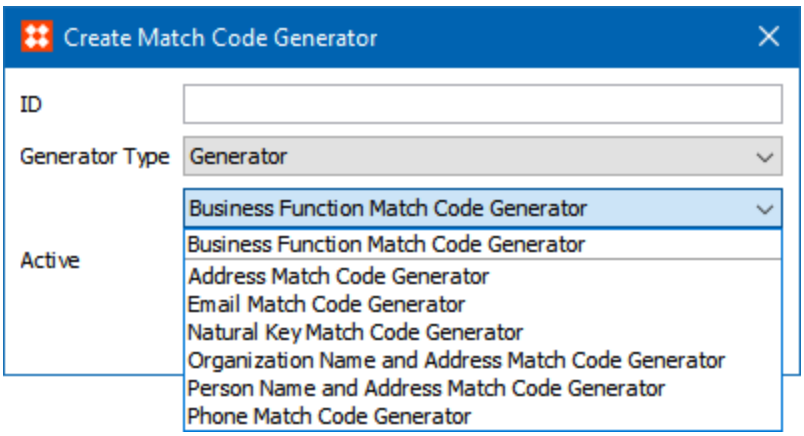


a. **Data** -This section of parameters are set variables for data coming into the matching algorithm. In this example, the data is normalized emails, either by an attribute or normalized through Business Functions. The following options are built-in for normalizing the data.

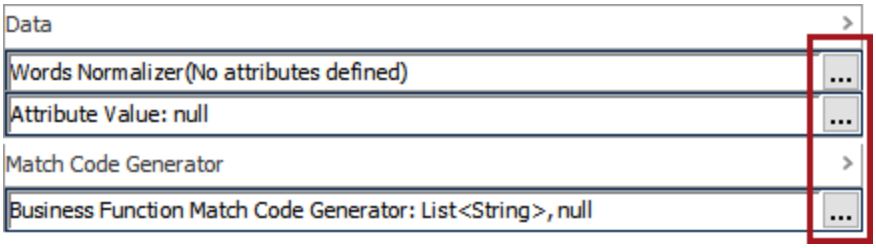


b. **Match Code Generator** - This section will house the Match Code Generator for this algorithm. The following screenshot shows all the options for a generator. For the sake of this guide, the

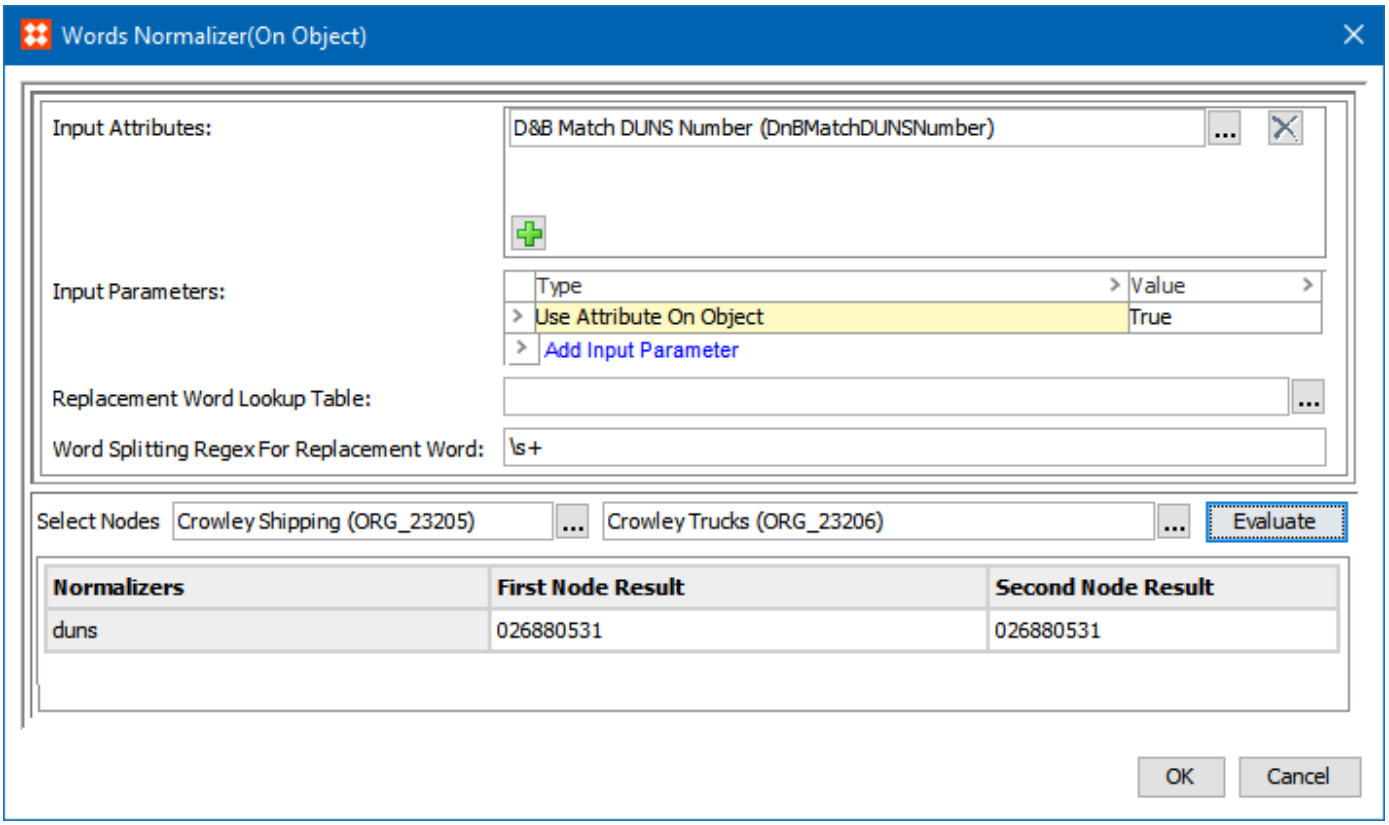
following process will use the Business Function option as a generator.



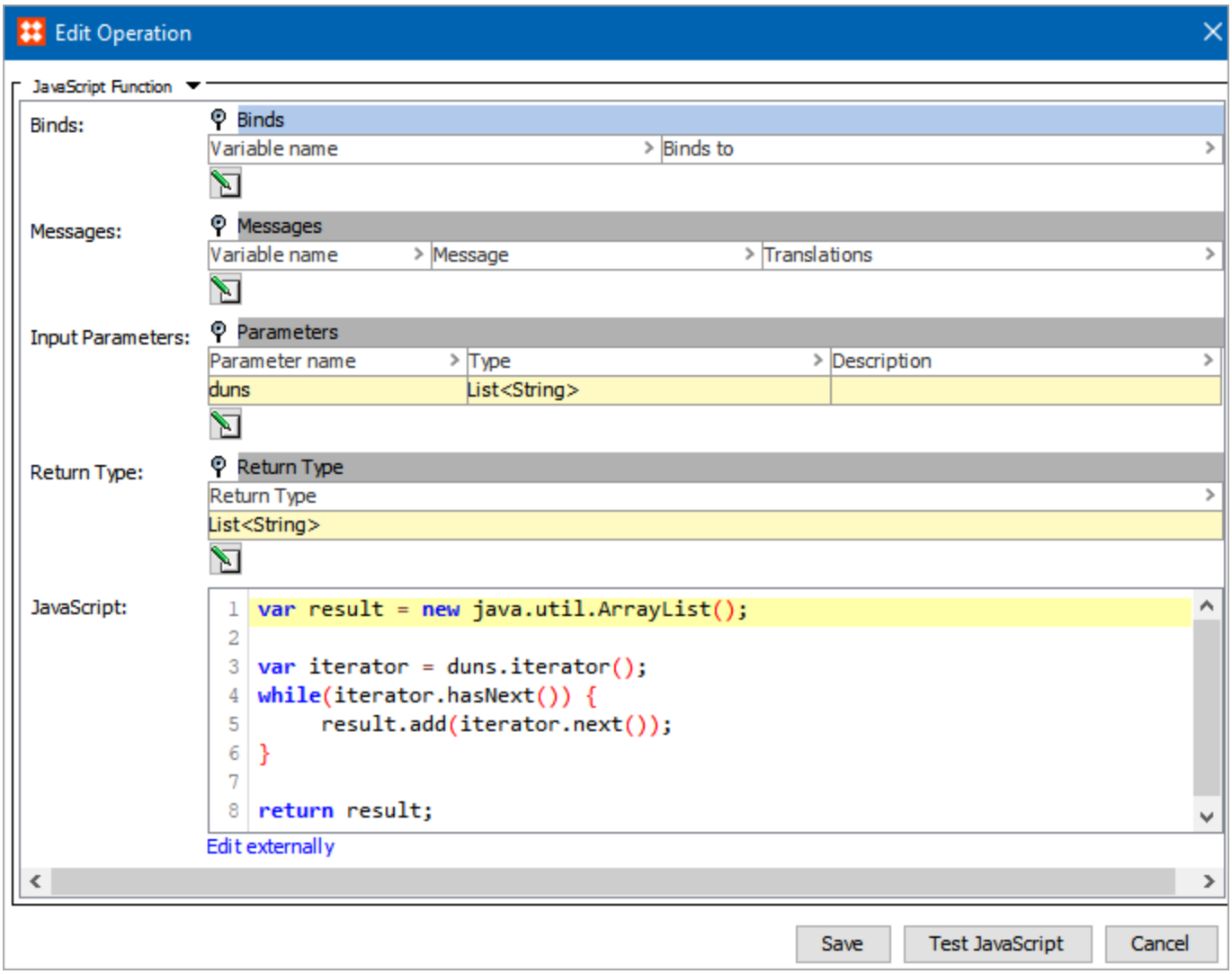
5. Once defined, the data section and the Match Code Generator require further configuration. Within the Match Criteria, select the relevant ellipsis button (...) to configure these variables.



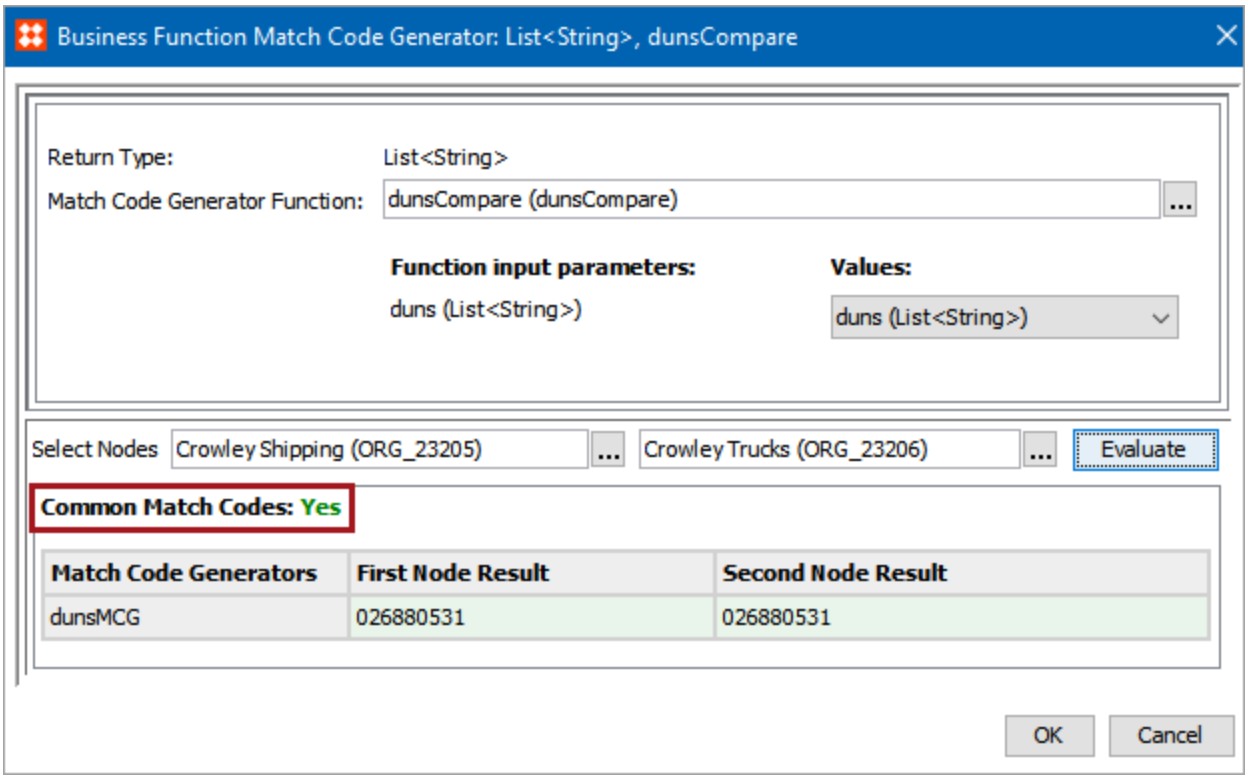
The 'Data' section will take on the values of the desired input parameters. Since this example is matching records based on a DUNS number, the 'DnBMatchDUNSNumber' attribute value is used. In the below screenshot, since the two records look similar, the evaluator is run and returns the normalized DUNS Number. This result is what is fed into the Match Code Generator.



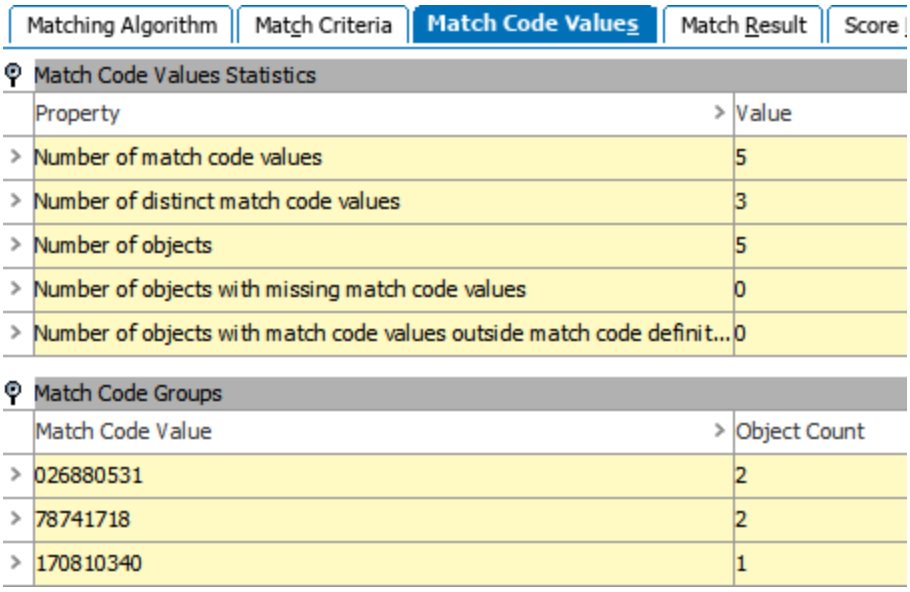
This example uses a preconfigured business function that looks like the following image. For more information, see the **Business Functions** topic in the **Business Rules** documentation.



With the preconfigured business function selected, ensure that the 'values' field is whatever the entering parameter should be. A 'None' value will not function. The example below demonstrates that the evaluation was successful by presenting a common match code.



Once configured, test the Match Code Generators with a variety of records to ensure that everything is properly configured. To test the Match Code Generator, some codes need to be created. The following example shows several matched records on the previously detailed Match Code Generator. For example purposes, all of these records share the same email. For more information, see the **Generating Match Codes and Running a Matching Algorithm** topic in this documentation.



Configuring Matching Algorithms

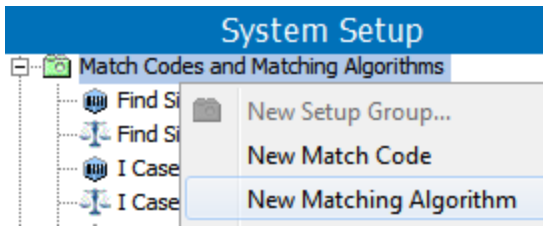
Before configuring a matching algorithm, ensure that you have developed a thorough matching, linking, and merging strategy. Among the many choices available, you must determine which string comparison method to use and what criteria it should follow.

For more information, see the **Match Criteria** section of the **Matching, Linking, and Merging** documentation.

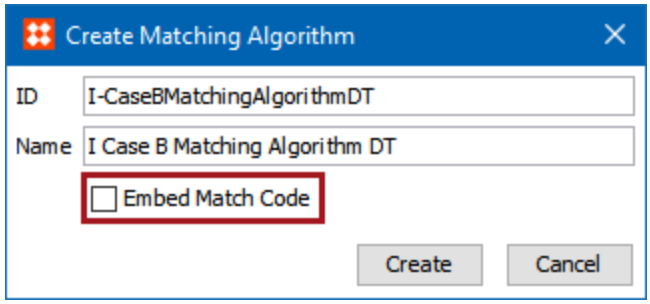
For additional information on configuring the accompanying matching algorithms and match codes, see the **Matching, Linking, and Merging Elements** and **Configuring Match Codes** documentation.

Configuration

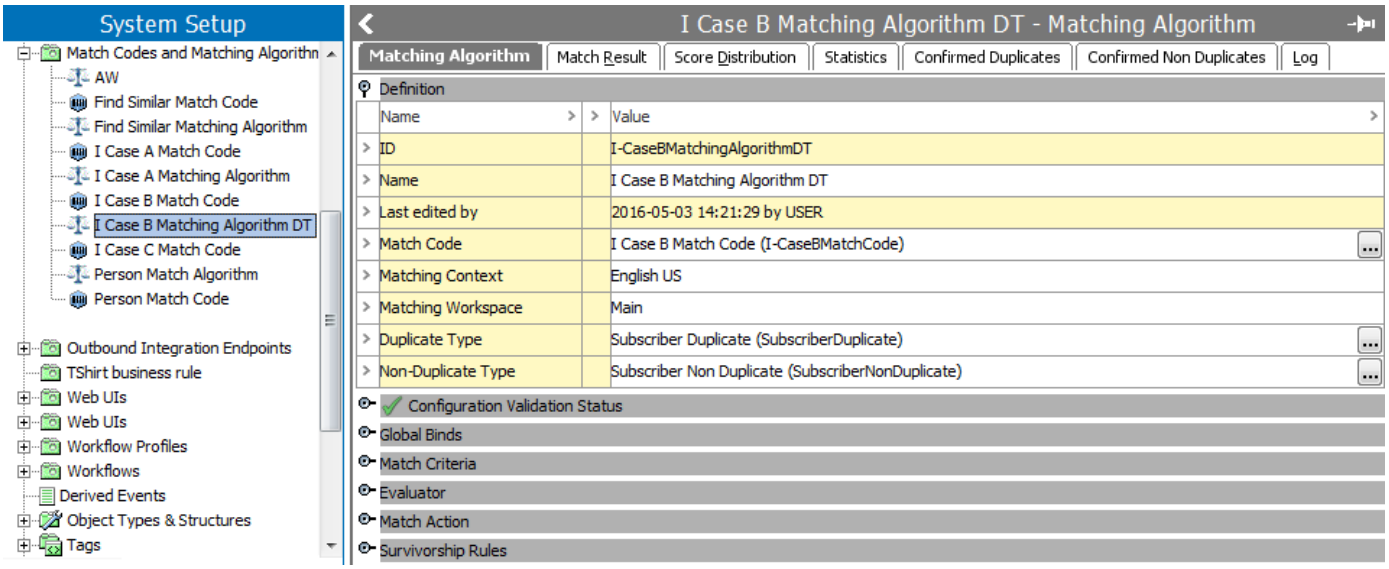
1. In **System Setup**, right-click the node configured to house matching algorithms and select 'New Matching Algorithm'.



2. In the 'Create Matching Algorithm' dialog, define an ID and name for the matching algorithm, and click **Create**. For embedded match code generation, ensure that the 'Embed Match Code' checkbox is selected. For more information on these match code generators, see the **Configuring a Match Code Generator** topic in this documentation.



3. On the Matching Algorithm editor, navigate to the 'Matching Algorithm' tab and click the ellipsis button (...) in the 'Match Code' field. Choose the applicable match code, and then click **Select**.

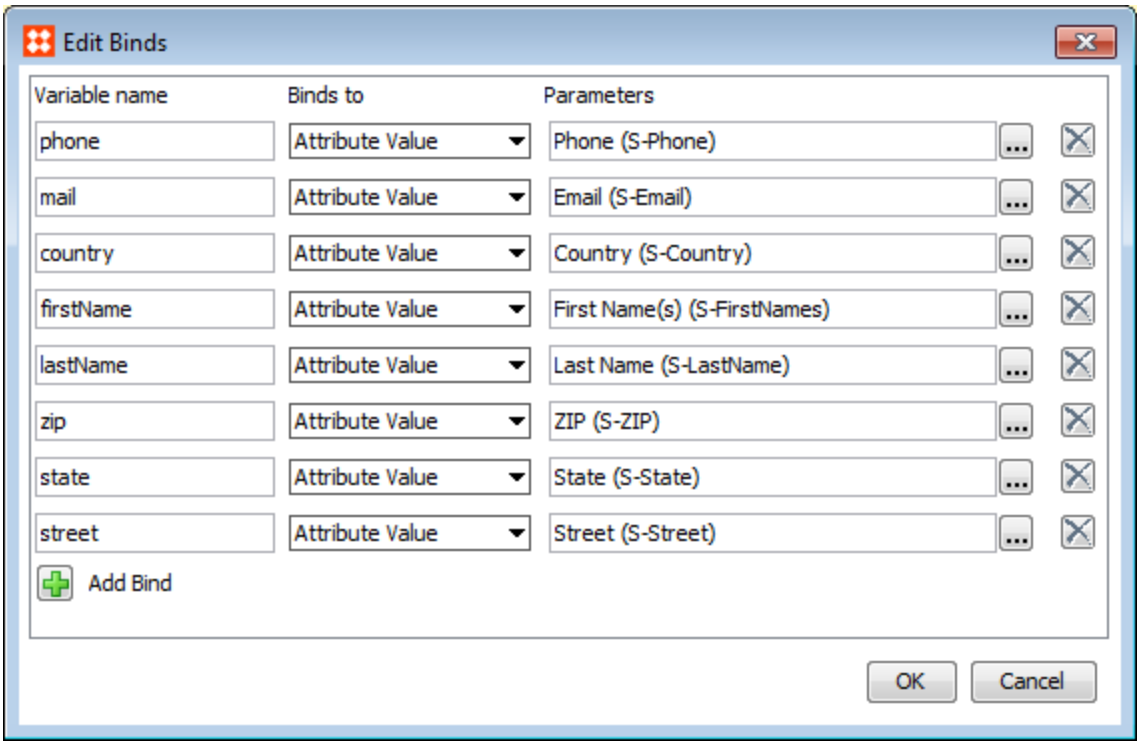


Note: The 'Configuration Validation Status' area displays a green check mark if the matching algorithm has a valid configuration. An 'X' is displayed if the configuration is invalid, as well as those aspects of the configuration with errors. These errors should be corrected before running the Matching Algorithm.

4. In the 'Matching Context' and 'Matching Workspace' fields, specify in which context and workspace to run the matching algorithm. This does not have to be the same context and workspace combination as used for the corresponding match code. By default, the current Context and Main workspace are selected.
5. In the 'Duplicate Type' field, click the ellipsis button (...). In the selector that appears, select the applicable reference type. Next, do the same for the 'Non-Duplicate Type' field. The reference types selected must correspond with those mapped in the component model.

   For more information, see the **Component Model Configuration** documentation.

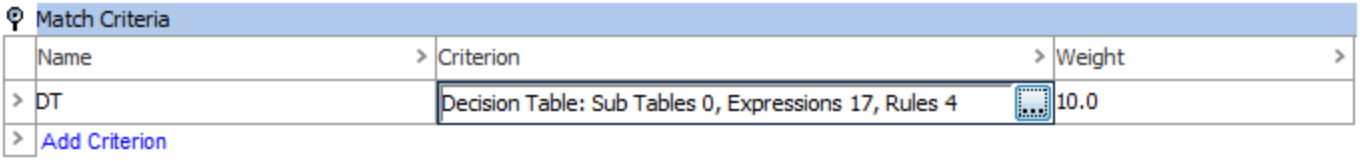
6. If global binds are required, open the 'Global Binds' flipper and click the **Edit** link. In the 'Edit Binds' dialog, click the Add Binds button to create a new bind, and then use the 'Binds to' dropdown to select a bind (some are displayed within a bind group). Next, if required, under 'Parameters', click the ellipsis button (...) to specify an object to bind via the selector dialog that appears. Finally, under 'Variable Name', specify a variable name for the bind. Click **OK** when finished.



For more information on using binds with matching algorithms, see the **Match Criteria** documentation.

Important: Global binds are not optimized for use with in-memory.

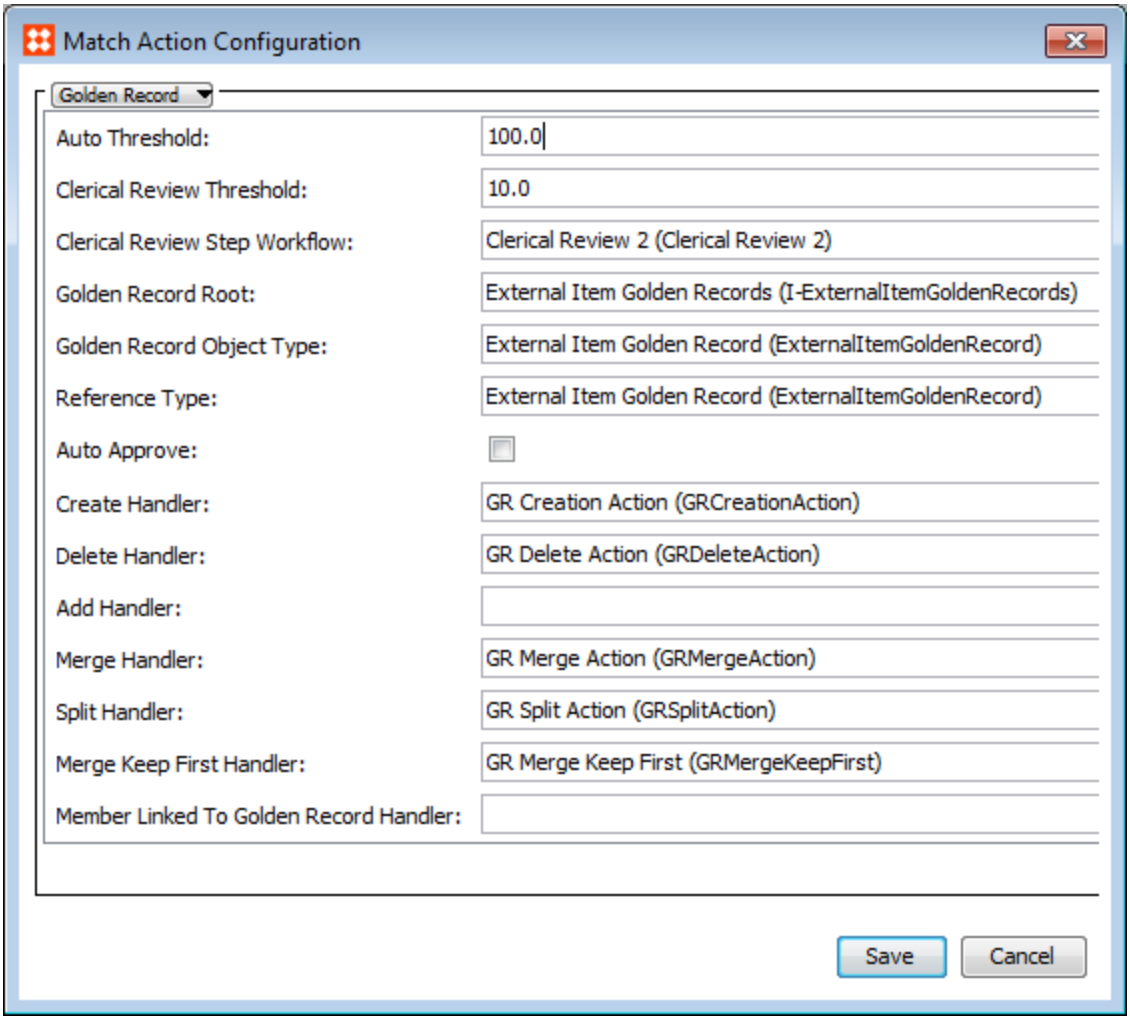
7. Open the 'Match Criteria' flipper, click the **Add Criterion** link to create a new criterion for the matching algorithm, then specify a name and match criterion in the dialog that appears. In the 'Criterion' field, click the ellipsis button (...) to open the editor and create the matching criterion. Once complete, specify a weight for the criterion via the 'Weight' field.



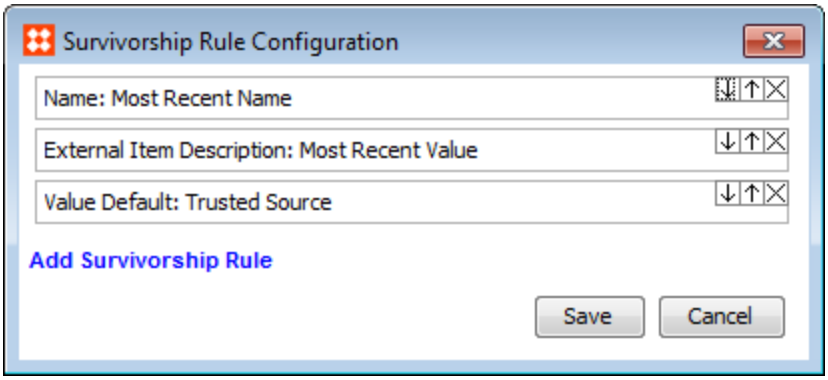
For more information on match criteria, see the **Match Criteria** documentation.

8. Once the match criteria has been configured, open the 'Evaluator' flipper to test the criteria on selected data.
9. Open the 'Match Action' flipper and click the **Edit** link. In the dialog that appears, specify a match action and click **Save** when finished.
   - For **Identify Duplicates**, specify the threshold via the 'Create Threshold' field. For more information, see the **Identify Duplicates Match Action** documentation.

- For a **Link Golden Record** or **Merge Golden Record** setup, several other fields need to be populated. For more information, see the **Configuring Golden Records** documentation.



10. If configuring a golden record match action, open the 'Survivorship Rules' flipper and click the **Edit** link to open the configuration dialog. Click the **Add Survivorship Rule** link and select a rule. Rules can be re-ordered using the arrow buttons and deleted with the 'X' button. Survivorship rules are not used to identify duplicates.



Note: If a survivorship rule is added but has not been configured, the Configuration Validation Status of the matching algorithm will display an 'X'.

For more information, see the **Golden Records Survivorship Rules** documentation.

Match Criteria

When configuring a matching algorithm the actual matching logic is defined under the 'Match Criteria' flipper of the matching algorithm.

Match Criteria

Name	Criterion	Weight
Simple Decision Table	Decision Table: Data 1, Matchers 0, Rules 4	100.0

Add Criterion

Binds used in the matching logic can be defined under the 'Global Binds' flipper.

Global Binds

Name	Refers to
phone	Attribute Value: Phone
mail	Attribute Value: Email
country	Attribute Value: Country
firstName	Attribute Value: First Name(s)
lastName	Attribute Value: Last Name
zip	Attribute Value: ZIP
state	Attribute Value: State
street	Attribute Value: Street

Edit

String Comparison Algorithms

While developing your matching, linking, and merging strategy, a string comparison algorithm must be chosen to serve as the foundation for the matching process. The available string comparison algorithms include:

- **Levenshtein distance** - A metric for how many edits (substitution, insertion, deletion) it takes to make one string look like another. For example, the Levenshtein distance between the strings 'AXR55487' and '8XRT5487' is 2 because the first and fourth digits are different. In STEP terms, the strings would be 75 percent alike (6/8*100).
- **Damerau-Levenshtein distance** - Similar to Levenshtein distance except that the transposition of two adjacent characters counts only as one edit, not two. For example, the Levenshtein distance between the strings 'AA67' and 'A6A7' is 2 while the Damerau Levenshtein distance is 1.
- **Jaro / Jaro-Winkler distance** - Outputs 0 or 1 where 0 is no similarity and 1 an exact match. Note that these algorithms are available and can be made accessible in STEP via JavaScript, but are not currently included in the STEP core.

Note: The Levenshtein / Damerau-Levenshtein distance has to be converted into a percentage manually.

Matching Algorithm Criteria

As is often the case, it may be that the preferred string comparison algorithm is not sufficient. To compensate for this, it is possible to define criteria that apply the Levenshtein / Damerau-Levenshtein distance directly to strings you build using STEP functions and automatically output an equality metric. Several criteria can be added and given weights that are used when calculating the total equality. The available criterion types are described bellow.

Multi Word Damerau-Levenshtein Distance

The Multi Word Damerau-Levenshtein distance is equal to the Damerau-Levenshtein distance except that transposition of two words does not count as an edit. For example, the distance between 'Paul Johnson' and 'Johnson Paul' is 0. This criterion can come in handy when working with names where first name and surname are in the same attribute value yet the order differs from object to object.

Number Distance

The Number Distance criterion returns the relative distance between two numbers expressed as a percentage: lowest number / highest number * 100. For example, with this simple way of calculating a difference, the numbers 1 and 2 will be as different or equal as 50 and 100.

Special cases:

- If one or both strings are not numerical values, the criterion returns '0'
- If only one of the strings is '0', the criterion returns '0'
- If both are '0', the criterion returns '100'
- If both strings are negative the calculation is the highest number / lowest number * 100
- If one value is positive and the other negative, the criterion returns '0'.

The data to apply the number distance calculation to is generated via STEP functions.

JavaScript

The JavaScript criterion allows you to define your own algorithm for comparing objects. The only requirement is that the result is a number between 0 and 100 (as before, representing the percentage of equality).

From the JavaScript criterion you can draw upon functions defined in business libraries in addition to six objects made available via bindings.

For more information, see the **JavaScript Binds** section of the **Matching, Linking, and Merging** documentation.

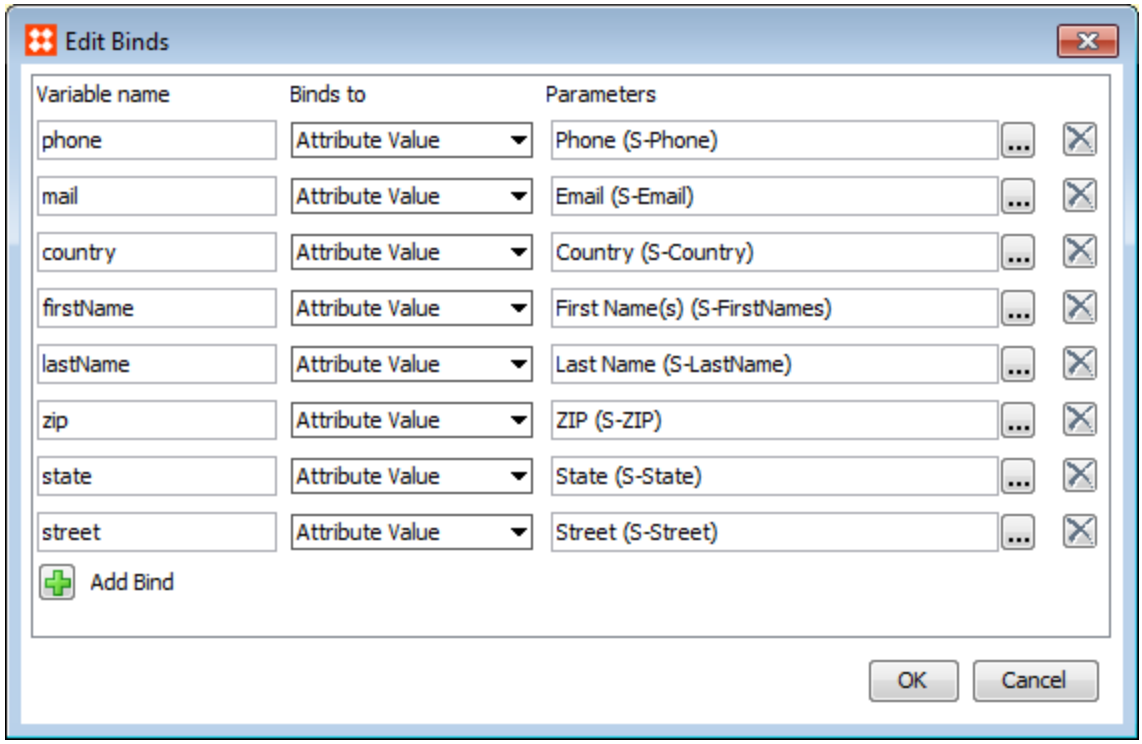
Decision Table

Decision Tables let you break the complexity of matching objects into smaller, more manageable parts. The algorithm is defined using various comparisons between the two objects and a set of rules that govern the conditions for the outcome.

For more information on decision tables, see the **Decision Tables** documentation.

Global Binds

The matching process can strain performance, and when large sets of data are to be processed, there is potentially a significant performance gain if the matching functionality can pre-fetch the values it has to work on. This way, the system will not have to build complete Java objects for the pairs being compared. This is possible via global binds configured on the matching algorithm, where attributes used in the matching algorithm logic can be bound to specific variable names. Values for the attributes will then be pre-fetched before the matching logic is applied, and can be referenced from both JavaScript and STEP functions. For these reasons, it is common setup to use global binds.

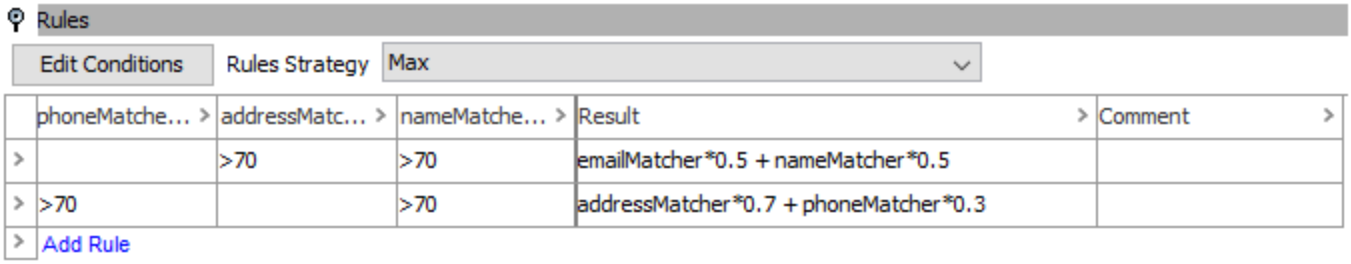


When working in JavaScript it is optimal to use only global binds, rather than the 'First Match Object' and 'Second Match Object' bindings which are designed for Find Similar. For more information on Find Similar functionality, see the **Find Similar** section of the **Using a Web UI** documentation.

Decision Tables

The Decision Table match criterion is a flexible and robust method of defining a matching algorithm. Like the other available criteria, a decision table can compare two objects and indicate to what degree they are similar. The algorithm is defined using various comparisons between these two objects and a set of rules governing the outcome.

In the example table below, separate comparisons are being handled simultaneously via a single decision table.



In the above case, the names, phone numbers, and addresses of customers are compared using the same table. The rows in this table represent different 'rules', and based on the 'Max' Rules Strategy, are evaluated simultaneously. In this example, the first rule states that if both 'nameMatcher' and 'addressMatcher' return true (meaning, in this case, that they are each at least greater than a 70% match) their individual match scores should be plugged into the corresponding result string (found under the Result column). According to the logic of this result string, the resulting score is calculated by combing 50% of the 'nameMatcher' score with 50% of the 'emailMatcher' score. If, for example, the decision table concluded that the names of two customers were an 80% match and their addresses were a 90% match, the resulting score would be '85' out of a possible total of '100' (80*0.5 + 90*0.5). In other words, these two customers are an 85% match.

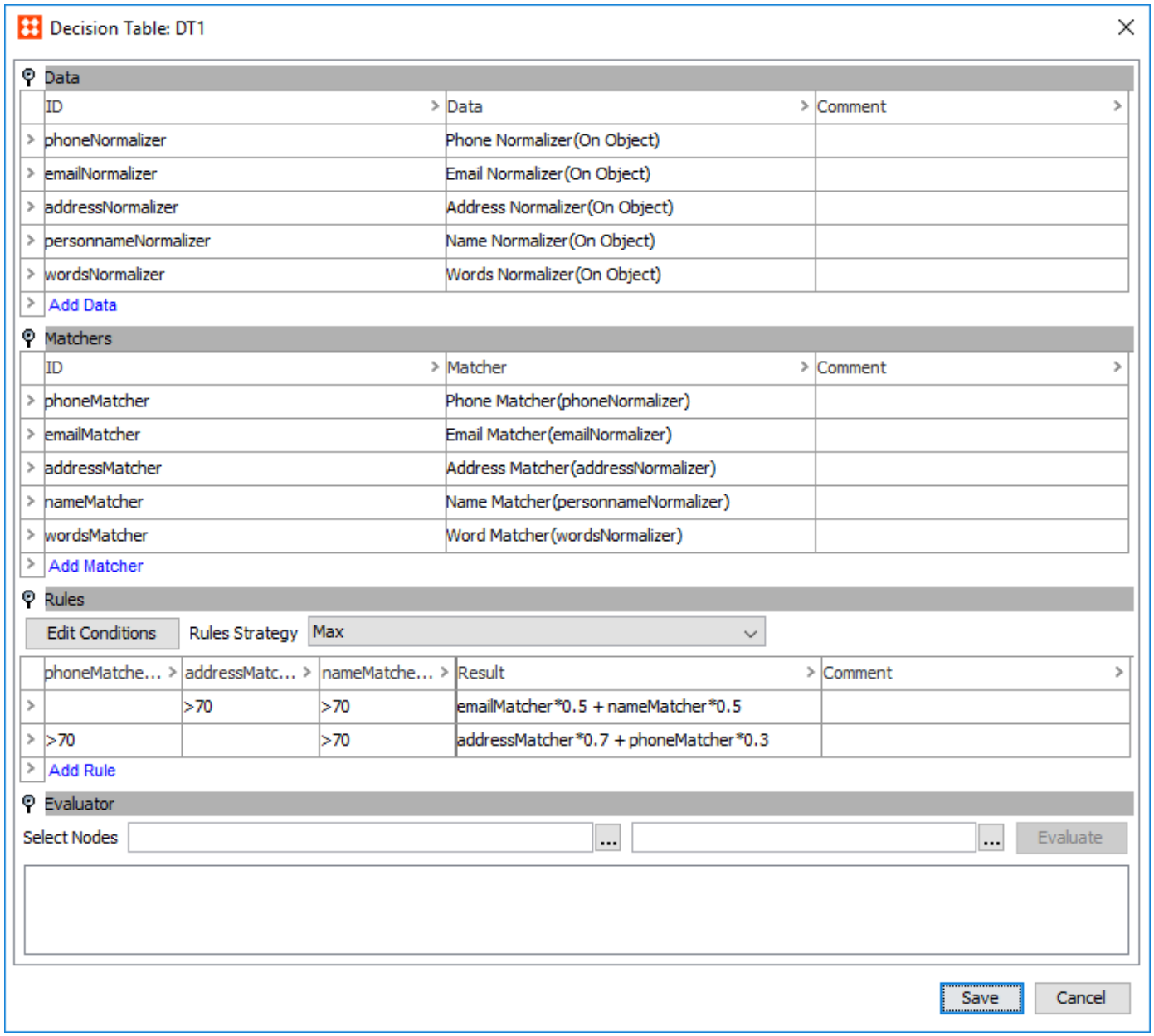
If 'nameMatcher' returns true but 'addressMatcher' does not, the decision table would consider the rule invalid and move on to the next rule, and continue to do so until all rules had been evaluated. If no matches are found after running through all of the rules in the table it will result in a '0'.

Decision Table Configuration

A decision table is separated into four sections: Data, Matchers, Rules, and Evaluator:

- **Data:** This section contains the data that the decision table matchers evaluate. The data can be represented by a constant expression, or it can be normalized. Additional party data matching-specific normalizers are available but require a license.
- **Matchers:** This section stores the matching logic that the decision table applies when evaluating the data. The matching logic can be defined via a STEP function or JavaScript function. If required for more complex configurations, sub decision tables can also be configured. Additional party data matching-specific matchers are available, but require a license.

- **Rules:** This section lists rules the decision table uses to determine whether two objects are a match. The matching logic defined in the 'Matchers' section is applied to this table in the form of conditions. These conditions ultimately determine the validity of each rule's result.
- **Evaluator:** This section is used to test the decision table against two objects.



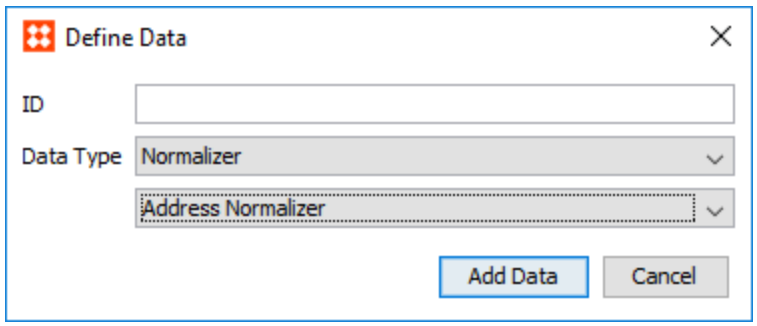
Data

The Data section of a Decision Table stores all data relevant to the algorithm, and lists the data as either normalized values or as constants expressions. The data added to this table is cited by the matching logic under the Matchers flipper.

Data

ID	Data	Comment
nameNormalizer	Name Normalizer(On Object)	
phoneNormalizer	Phone Normalizer(On Object)	
emailNormalizer	Email Normalizer(On Object)	
addressNormalizer	Address Normalizer(On Object)	
Add Data		

1. To add data to the table, click the **Add Data** link.
2. In the 'Define Data' popup dialog, enter an ID for the data and use the Data Type dropdown(s) to define the data type, then click **Add Data**.



Important: No two normalizers or constants should have the same ID.

3. Populate the Data column of the table:
   - For constants, enter a constant expression.
   - For normalizers, click the ellipsis button (...) to access the configuration. Configuration steps vary depending on the type of normalizer selected. For more information on these normalizers, see the **Decision Table Normalizers** section of the documentation.

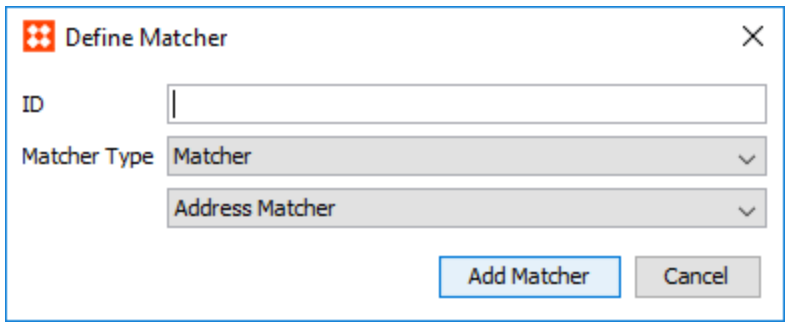
Matchers

Matchers drive the decision table's matching logic by applying different weights, condition thresholds, and other metrics to data provided by the Data section. Sub tables can be configured in this section for especially complex setups.

Matchers

ID	Matcher	Comment
namerMatcher	Name Matcher(nameNormalizer)	
phoneMatcher	Phone Matcher(phoneNormalizer)	
emailMatcher	Email Matcher(emailNormalizer)	
addressMatcher	Address Matcher(addressNormalizer)	
Add Matcher		

1. To add a matcher to the table, click the **Add Matcher** link.
2. In the Define Matcher popup dialog, enter an ID for the matcher and use the Matcher Type dropdown(s) to define the match type, then click **Add Matcher**.



Important: No two matchers should have the same ID.

3. Populate the Matcher column of the table:
   - For matchers, click the ellipsis button (...) to access the configuration. Configuration steps vary depending on the type of matcher selected. For more information on these matchers, see the **Decision Table Matchers** section of the documentation.
   - For sub tables, click the ellipsis button (...) to access the configuration.

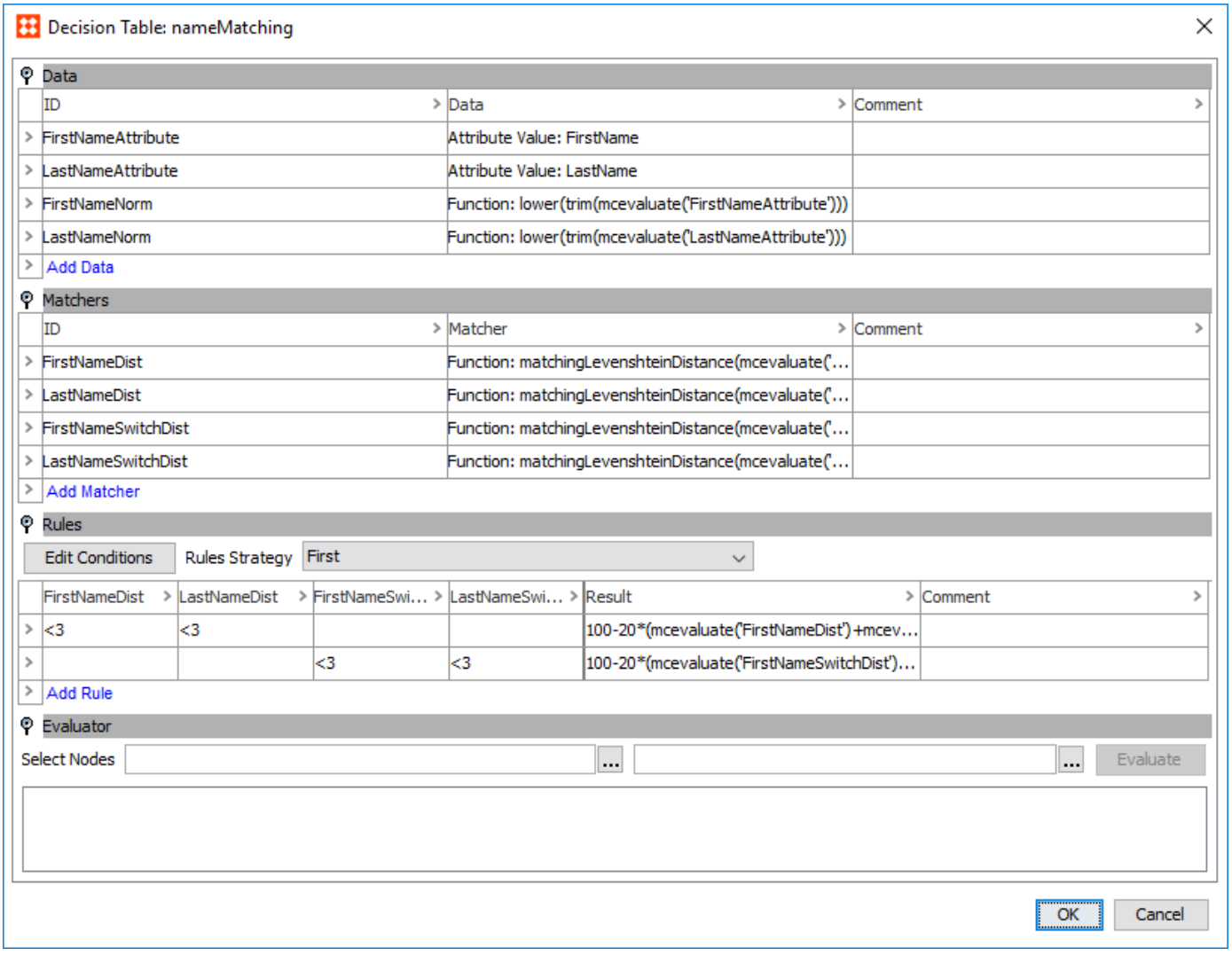
     Sub Tables are optional decision tables used for breaking a complex algorithm down into smaller, more manageable parts. A decision table within a decision table, essentially. Proper use of sub tables can greatly improve the clarity of complex matching algorithms, making them much easier to understand and maintain.

     A matching algorithm for a customer record can, for example, be split into sub tables for name, address, and phone number, leaving the details of matching these aspects in the sub tables.

Matchers

ID	Matcher	Comment
nameMatching	Decision Table: Data 4, Matchers 4, Sub Tables 0, Rules 2 ...	
emailMatching	Decision Table: Data 1, Matchers 2, Sub Tables 0, Rules 2	
phoneMatching	Decision Table: Data 1, Matchers 1, Sub Tables 0, Rules 2	
Add Matcher		

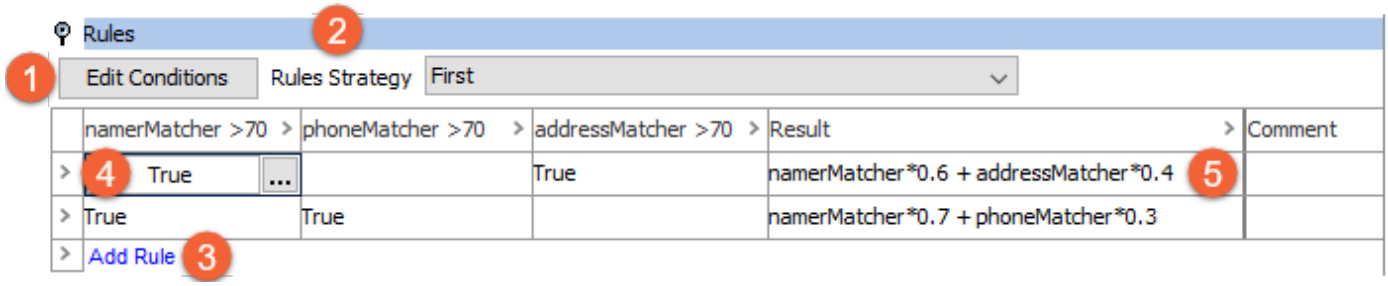
To access a sub decision table, click the ellipsis button (...) in the Matcher column of the desired table.



Rules

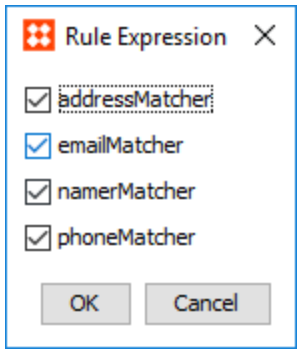
Once all of the required matchers have been configured, a set of rules must be established for the decision table to follow. These rules dictate the final outcome of any matches the decision table evaluates.

Each matcher is represented as a condition column on the Rules table, and each row corresponds to a separate rule. Other columns include 'Result,' which determines the resulting score of the matched objects, and 'Comment.' For each condition column, the condition threshold is displayed next to the name of the matcher that was mapped there (provided that matcher has a condition threshold defined).

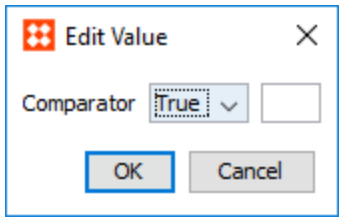


In the above example, the '>70' value displayed in the top row of the three conditions has been provided by the corresponding matcher configurations, each of which states that if it exceeds a condition threshold of '70' it will return 'True.' In some cases, such as when using a more function-based decision table, the threshold will not be established in the matcher configuration and must instead be defined in the table cell in place of 'True.' For more information, see the **Decision Table Matchers** section of the documentation.

1. **Edit Conditions:** Matchers can be added / removed from the Rules table by clicking the **Edit Conditions** button, and selecting the desired matchers from the 'Rule Expression' popup dialog.



2. **Rules Strategy:** The Rules Strategy determines how the rules are applied when generating a match result. Two options are available from the dropdown: 'First' and 'Max.' Selecting 'First' tells the decision table to look at the rules from top to bottom and base the results on the first rule in which all conditions return 'True.' Alternatively, selecting 'Max' tells the decision table to evaluate all conditions that return 'True' and combine their maximum results.
3. **Add Rule:** Click the **Add Rule** link in order to add a row to the table.
4. **Rule Condition:** If a particular condition should be included in a rule, click the ellipsis button (...) and add a comparator via the 'Edit Value' popup dialog.

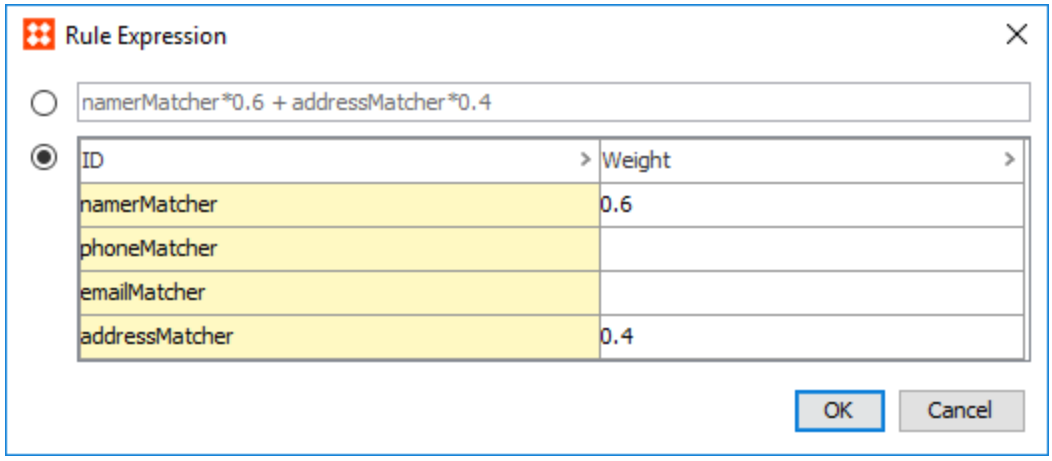


Alternatively, the comparator can be entered directly into the cell.

If the condition threshold is defined in the matcher configuration, select 'True.' If it is not, manually enter the condition threshold.

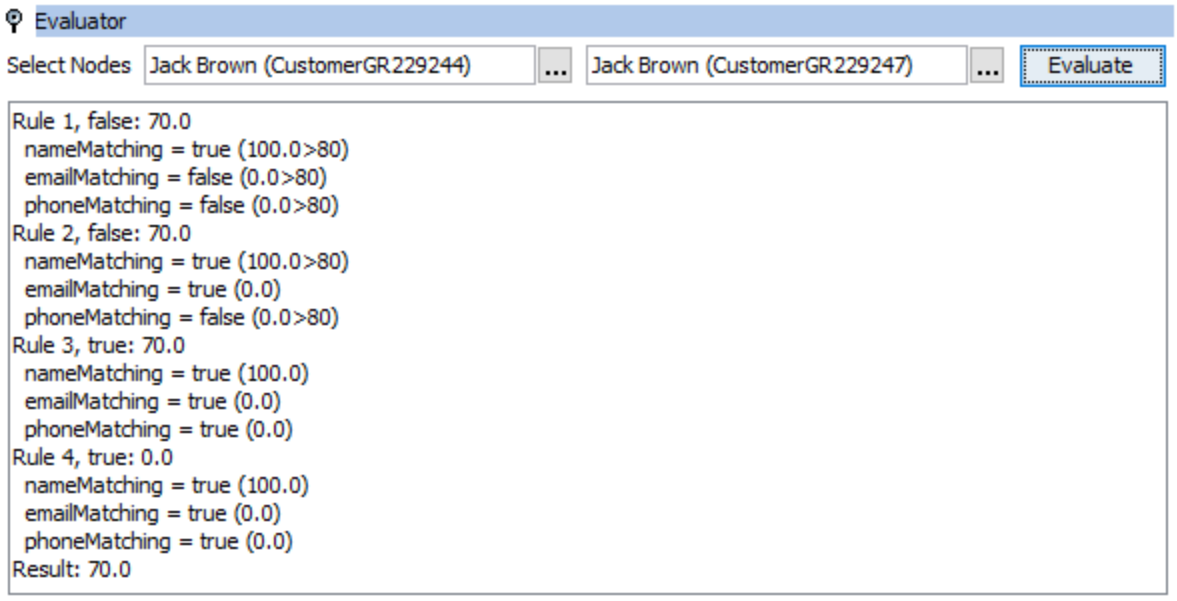
5. **Rule Result:** Each decision table rule requires an expression that drives the logic of the resulting score. In most cases, this is as simple as assigning weights to all conditions relevant to the rule. To create an expression, enter the expression directly into the cell.

   Alternatively, click the ellipsis button (...) to access the 'Rule Expression' dialog and click the table radio button. Enter the desired weights for the relevant conditions and click **OK**. This will automatically generate the relevant expression.



Evaluator

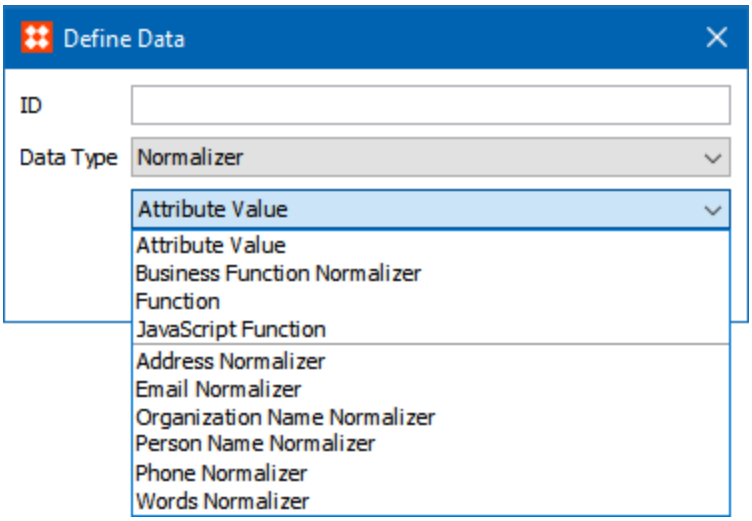
The evaluator is a tool for diagnosing unexpected results that may be encountered. In the evaluator, select two objects that you want to compare. It reports the results and provides detailed information about how the result was obtained. If additional details are required, the evaluators of the sub components can be used.


Evaluator
Select Nodes
Jack Brown (CustomerGR229244)
...
Jack Brown (CustomerGR229247)
...
Evaluate
Rule 1, false: 70.0
nameMatching = true (100.0>80)
emailMatching = false (0.0>80)
phoneMatching = false (0.0>80)
Rule 2, false: 70.0
nameMatching = true (100.0>80)
emailMatching = true (0.0)
phoneMatching = false (0.0>80)
Rule 3, true: 70.0
nameMatching = true (100.0)
emailMatching = true (0.0)
phoneMatching = true (0.0)
Rule 4, true: 0.0
nameMatching = true (100.0)
emailMatching = true (0.0)
phoneMatching = true (0.0)
Result: 70.0

Decision Table Normalizers

Normalizers take one or more attribute values and outputs a normalized value(s). They can be configured using either JavaScript, STEP functions, Business Functions, or an option called 'Attribute Value' that lets you reference the value for a specific attribute.

Customer data normalizer templates are also available for those with the required license. For more information on this license, ask your system administrator.



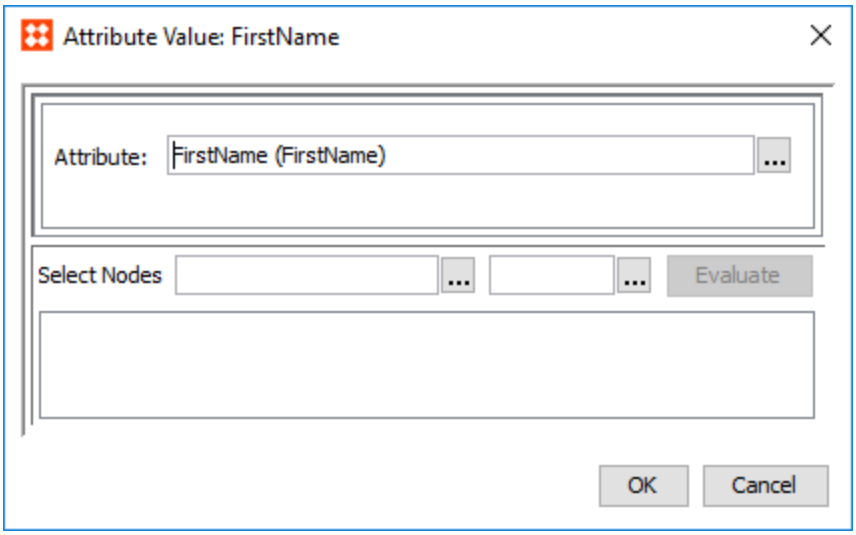
Standard Normalizers

Standard Normalizers include:

- Attribute Value
- Business Function Normalizer
- STEP Functions
- JavaScript Functions
- Constants

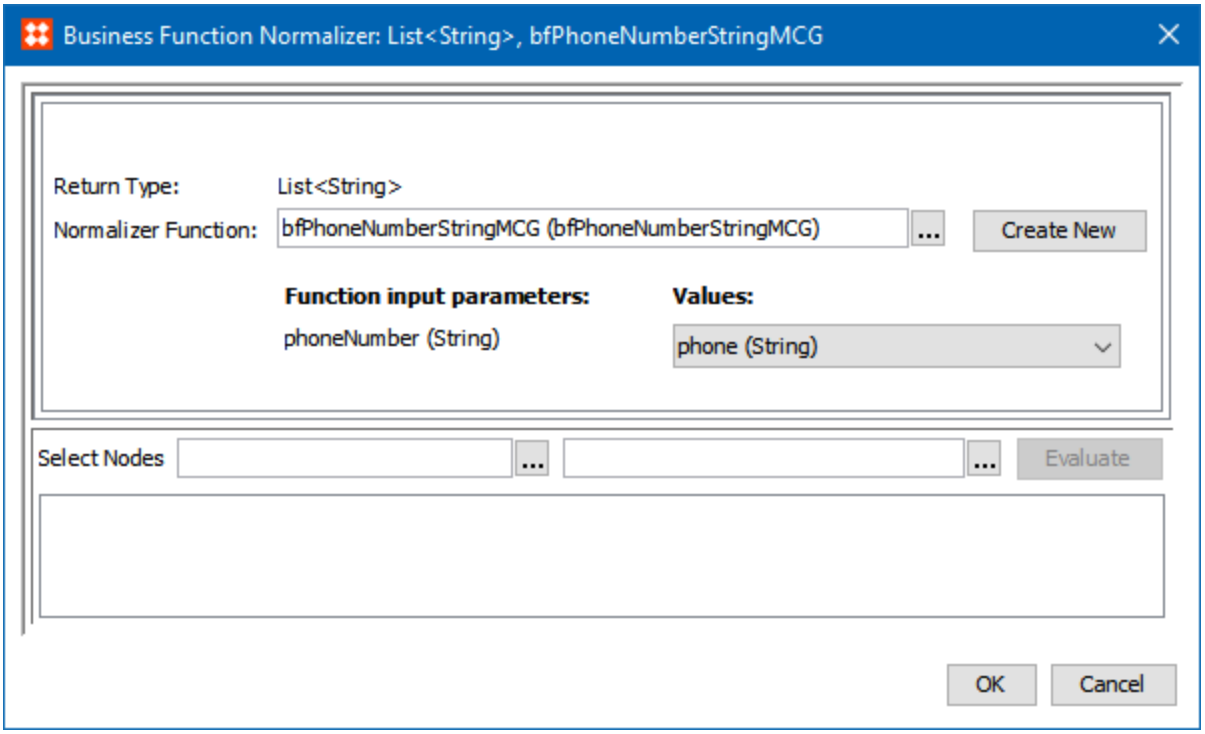
Attribute Value

The Attribute Value normalizer allows users to specify a single attribute and output its value. To specify an attribute for this normalizer, click the ellipsis button (...) and browse or search for the desire attribute.



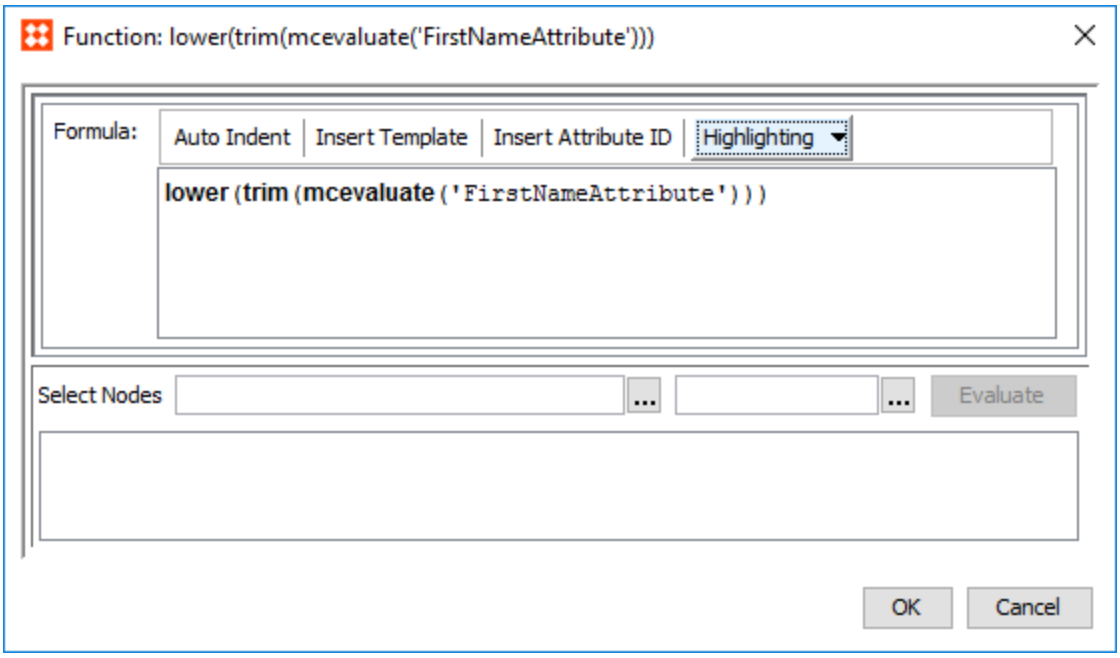
Business Function Normalizer

Business functions are a type of business rule which produces a result. These functions can be used to return normalized data based on how they are configured. For more information, see the **Business Functions** topic of the **Business Rules** documentation.



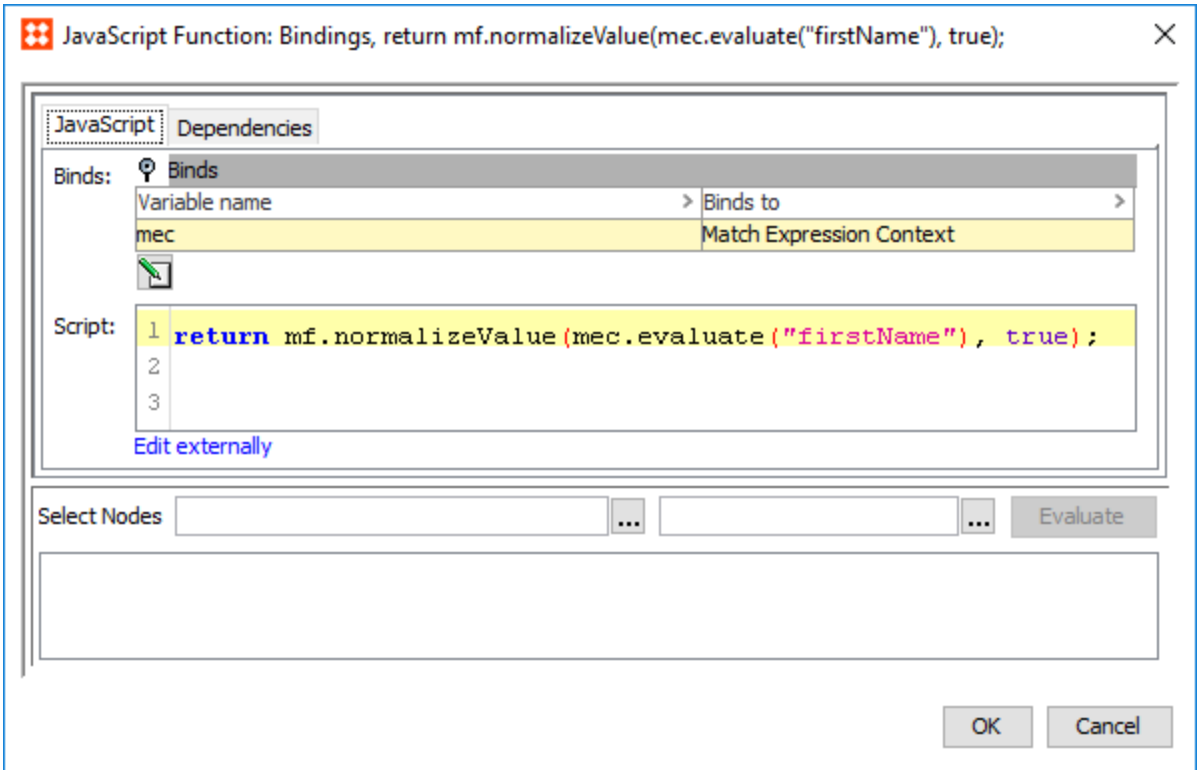
STEP Function

Called 'Function' on the dropdown list, this option will normalize values can be produced via STEP functions.



JavaScript Function

Normalized values can be produced via JavaScript functions.



Customer Data Normalizers

These normalizer templates are intended for use in customer data solutions:

- Address Normalizer
- Email Normalizer
- Organization Name Normalizer
- Person Name Normalizer
- Phone Normalizer
- Words Normalizer

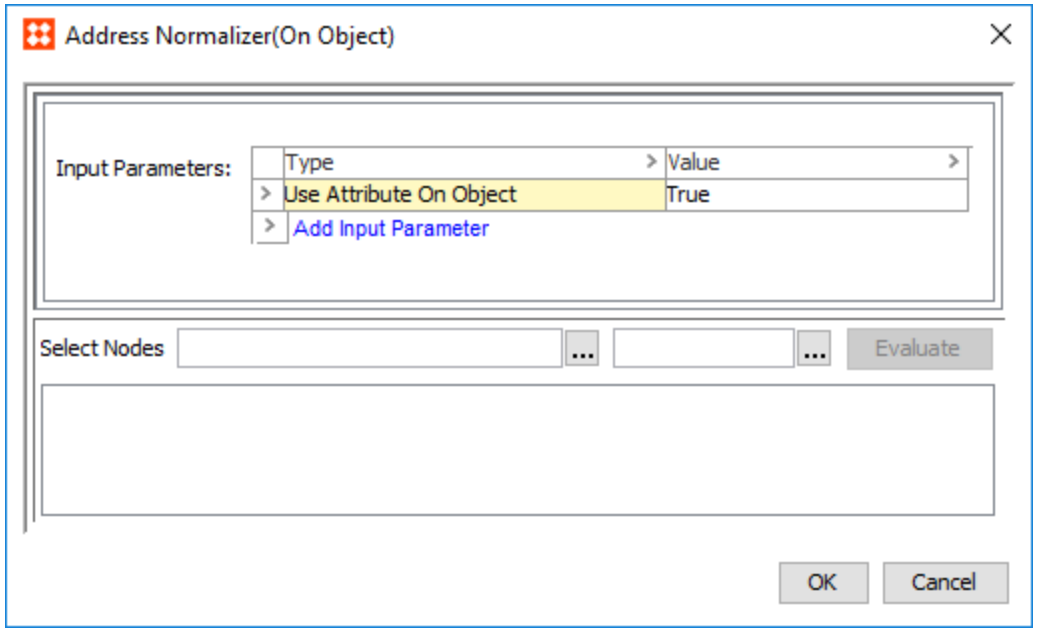
Address Normalizer

The Address Normalizer can produce a normalized set of addresses for use in the corresponding Address Matcher. This data is provided by the input address element attributes mapped to the Address Component Model and include: Country, Region, City, Postcode, Street, and Country ISO Code.

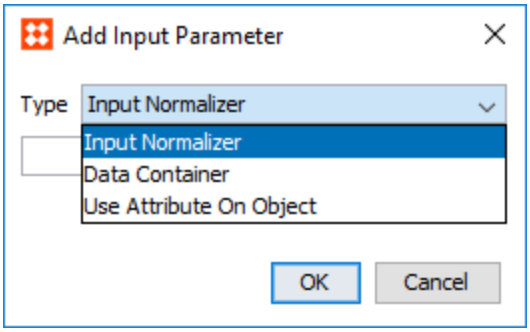
Note: If the postal code mapped to the corresponding standardized component model parameter is valid for the objects being compared, the decision table will output normalized values for address attributes mapped to the standardized attribute fields on the component model.

For more information on the Address Component Model, see the **Address Component Model** section of the **Data Integration** documentation.

1. To normalize customer address data, click the ellipsis button (...) in the Data column to access the configuration.



2. Click the **Add Input Parameter** link, and in the popup dialog, select the input type from the dropdown.
   - Input Normalizer: Enter the ID of another Address Normalizer to use its output. Typically, this normalizer is written in JavaScript.
   - Data Container: When you select 'Data Container,' click the ellipsis button (...) and browse or search for a data container. The selected data container will have its address data normalized when used in a matcher.
   - Use Attribute on Object: When you select 'Use Attribute On Object', click the dropdown and select 'True.' This input parameter will normalize valid address data that has been mapped to the Address Component Model. This input parameter will be configured by default.

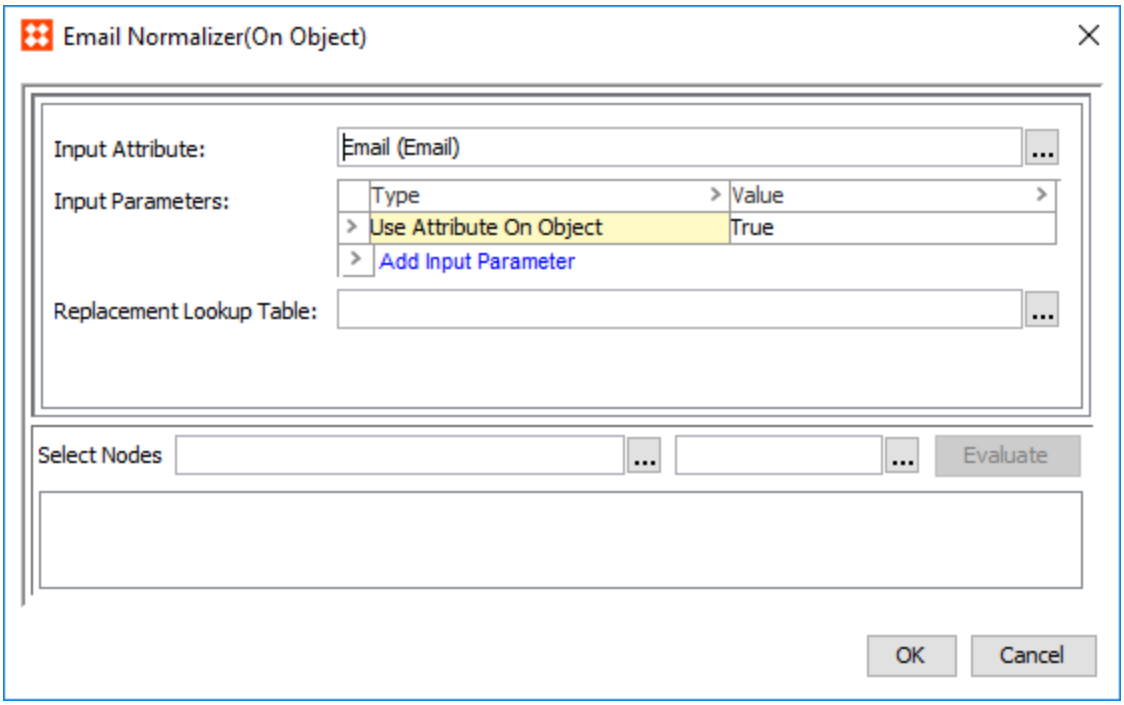


3. Click **OK** once the selection is made.

Email Normalizer

An Email Normalizer can normalize email data for use in the corresponding Email Matcher.

1. To normalize customer email data, click the ellipsis button (...) in the Data column to access the configuration.

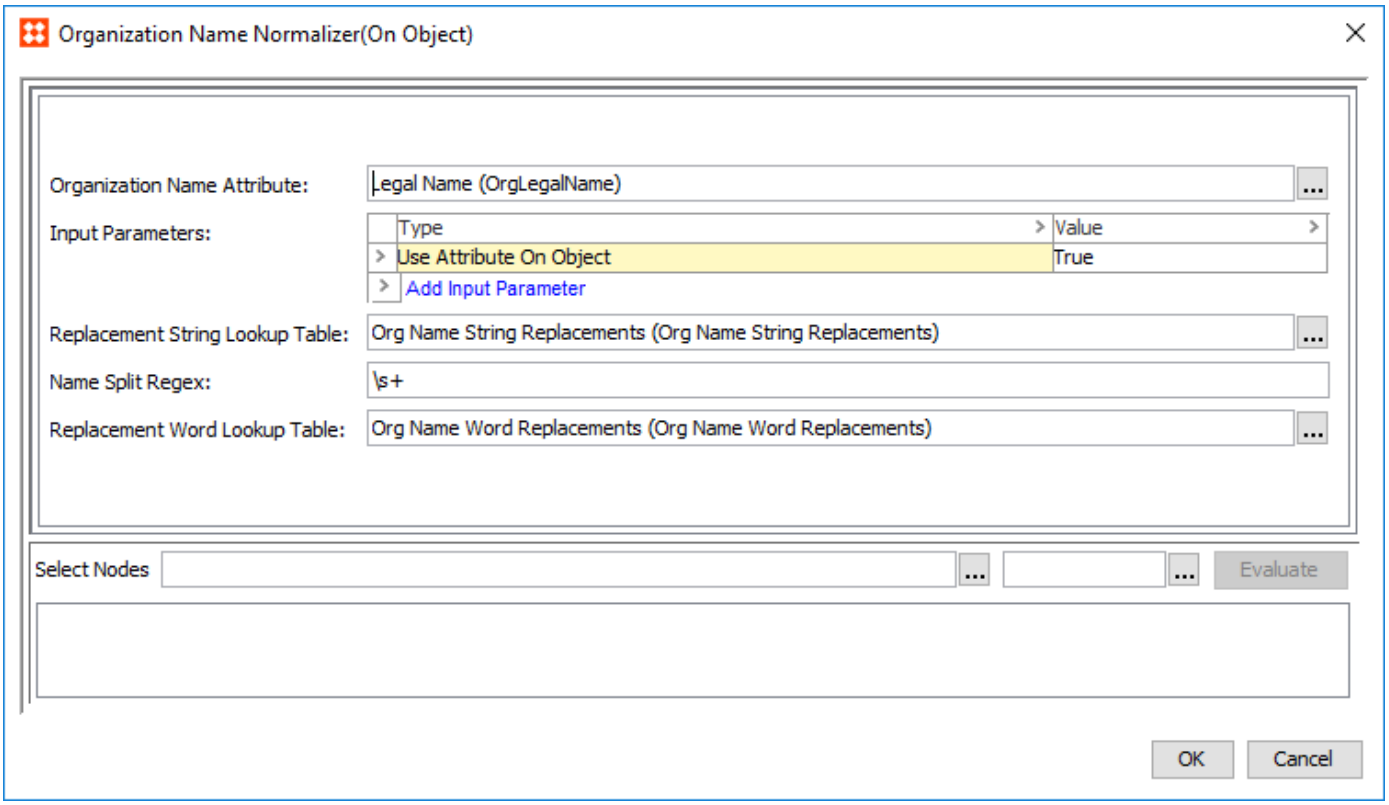


2. For the **Input Attribute** parameter, click the ellipsis button (...) and browse or search for an email attribute to normalize.
3. Click the **Add Input Parameter** link, and in the Add Input Parameter popup dialog, select the input type from the dropdown.
   - Input Normalizer: Enter the ID of another Email Normalizer to use its output. Typically, this normalizer is written in JavaScript.
   - Data Container: When you select 'Data Container,' click the ellipsis button (...) and browse or search for a data container. The selected data container will have its email data normalized when used in a matcher.
   - Use Attribute on Object: When you select 'Use Attribute On Object,' click the dropdown and select 'True.' This input parameter will normalize the email attribute mapped to the **Input Attribute** field. This input parameter will be configured by default.
4. For the **Replacement Lookup Table** parameter, click the ellipsis button (...) and select a lookup table. Typically, this is used to remove invalid email values.
5. Click **OK** when finished.

Organization Name Normalizer

An Organization Name Normalizer can normalize organization name data for use in the corresponding Organization Name Matcher.

1. To normalize organization name data, click the ellipsis button (...) in the Data column to access the configuration.



2. For the **Organization Name Attribute** parameter, click the ellipsis button (...) and browse or search for an organization name attribute to normalize.
3. Click the **Add Input Parameter** link, and in the Add Input Parameter popup dialog, select the input type from the dropdown.
   - Input Normalizer: Enter the ID of another Organization Name Normalizer to use its output. Typically, this normalizer is written in JavaScript.
   - Data Container: When you select 'Data Container,' click the ellipsis button (...) and browse or search for a data container. The selected data container will have its organization name data normalized when used in a matcher.
   - Use Attribute on Object: When you select 'Use Attribute On Object,' click the dropdown and select 'True.' This input parameter will normalize the organization name attribute mapped to the **Organization Name Attribute** field. This input parameter will be configured by default.
4. For the **Replacement String Lookup Table** parameter, click the ellipsis button (...) and select a lookup table. This is used to account for inconsistencies in organization names by defining semantically equivalent strings (especially the usage of apostrophes and quotations). For example, normalizing *'s* to be *s* would change the organization name *ACME's* into *ACMEs*. Normalizing *'n'* to be *and* would change the organization name *ACME'n'SON* to *ACME and SON*.

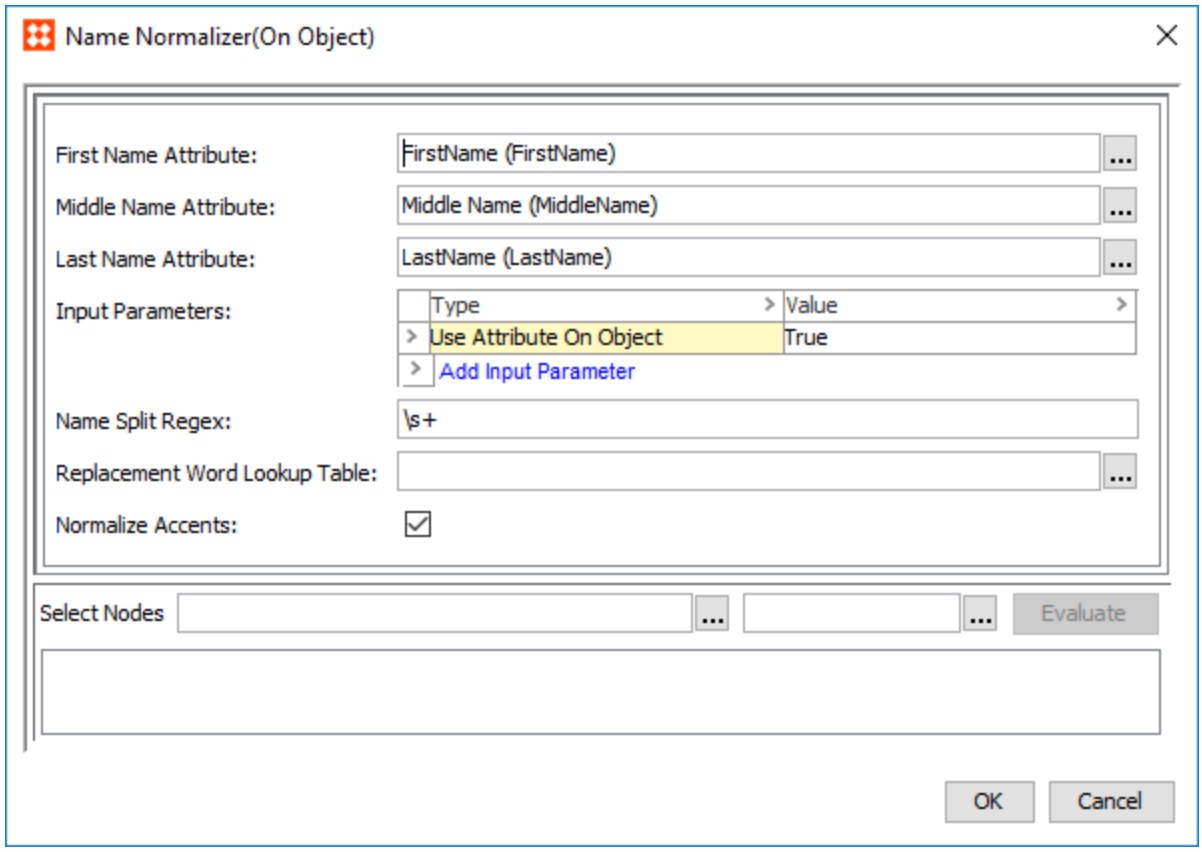
5. For the **Name Split Regex** parameter, enter the regex used to split the value of **Organization Name Attribute** into words.
6. For the **Replacement Word Lookup Table** parameter, click the ellipsis button (...) and select a lookup table.

   Typically, this is used to account for the inconsistent use of common words in organization names. For example, *&* can be replaced by *and*.
7. Click **OK** when finished.

Person Name Normalizer

A Person Name Normalizer can normalize name data for use in the corresponding Person Name Matcher.

1. To normalize customer name data, click the ellipsis button (...) in the Data column to access the configuration.



2. For the **First Name Attribute** parameter, click the ellipsis button (...) and browse or search for a first name attribute to normalize. Repeat this step for the **Middle Name Attribute** and **Last Name Attribute** parameters.
3. Click the **Add Input Parameter** link, and in the Add Input Parameter popup dialog, select the input type from the dropdown.

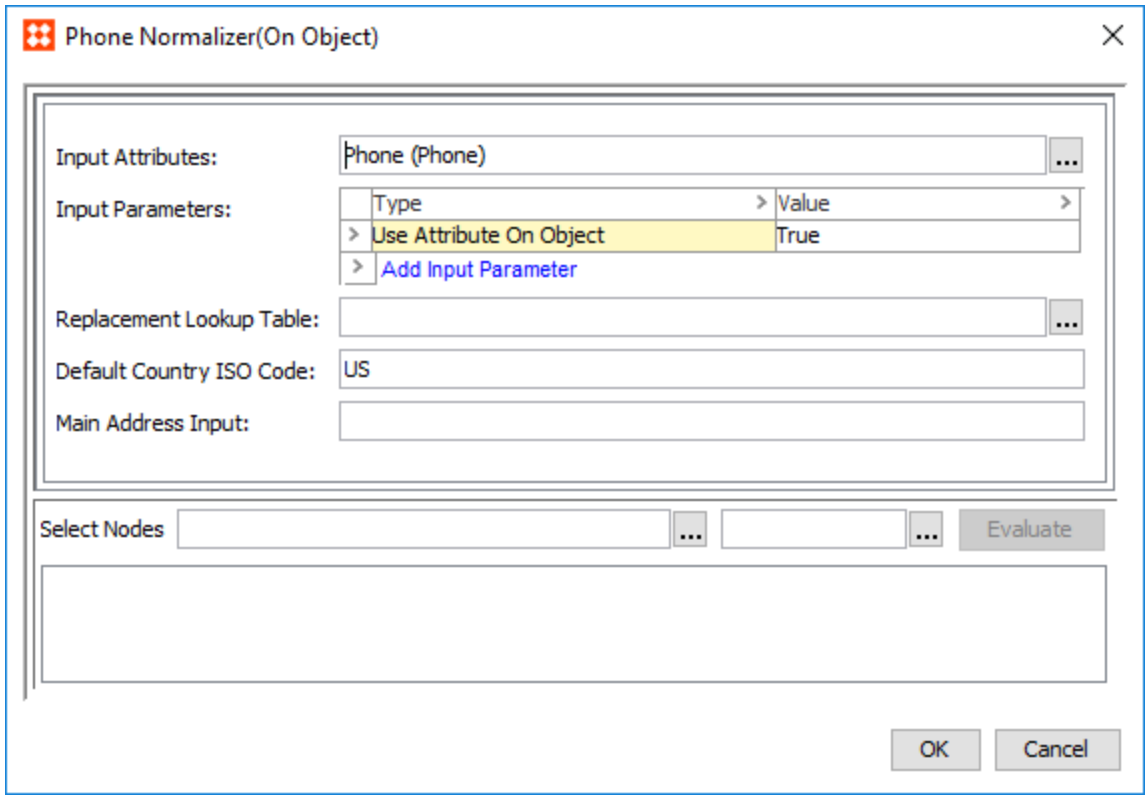
- Input Normalizer: Enter the ID of another Person Name Normalizer to use its output. Typically, this normalizer is written in JavaScript.
- Data Container: When you select 'Data Container,' click the ellipsis button (...) and browse or search for a data container. The selected data container will have its name data normalized when used in a matcher.
- Use Attribute on Object: When you select 'Use Attribute On Object,' click the dropdown and select 'True.' This input parameter will normalize the name attributes mapped to the **First Name Attribute**, **Middle Name Attribute**, and **Last Name Attribute** fields, and output them as one value. This input parameter will be configured by default.

4. For the **Name Split Regex** parameter, enter the regex used to split the First Name, Middle Name, and Last Name values into words.
5. For the **Replacement Lookup Table** parameter, click the ellipsis button (...) and select a lookup table. Typically, this is used to remove unwanted words from names. For example, 'Mr.,' 'Dr.,' or 'Von'.
6. Check the **Normalizer Accents** box if accented characters should be normalized.
7. Click **OK** when finished.

Phone Normalizer

A Phone Normalizer can normalize phone data for use in the corresponding Phone Matcher.

1. To normalize customer phone data, click the ellipsis button (...) in the Data column to access the configuration.



2. For the **Input Attribute** parameter, click the ellipsis button (...) and browse or search for a phone attribute to normalize.
3. Click the **Add Input Parameter** link, and in the Add Input Parameter popup dialog, select the input type from the dropdown.
   - Input Normalizer: Enter the ID of another Phone Normalizer to use its output. Typically, this normalizer is written in JavaScript.
   - Data Container: When you select 'Data Container,' click the ellipsis button (...) and browse or search for a data container. The selected data container will have its phone data normalized when used in a matcher.
   - Use Attribute on Object: When you select 'Use Attribute On Object,' click the dropdown and select 'True.' This input parameter will normalize the phone attribute mapped to the **Input Attribute** field. This input parameter will be configured by default.
4. For the **Replacement Lookup Table** parameter, click the ellipsis button (...) and select a lookup table. Typically, this is used to remove invalid phone values.
5. For the **Default Country ISO Code** parameter, enter a two letter ISO code string.
6. For the **Main Address Input** parameter, enter the ID of an Address Normalizer. The Country ISO Code value of the normalizer output is used in place of the Default ISO Code, if one exists.

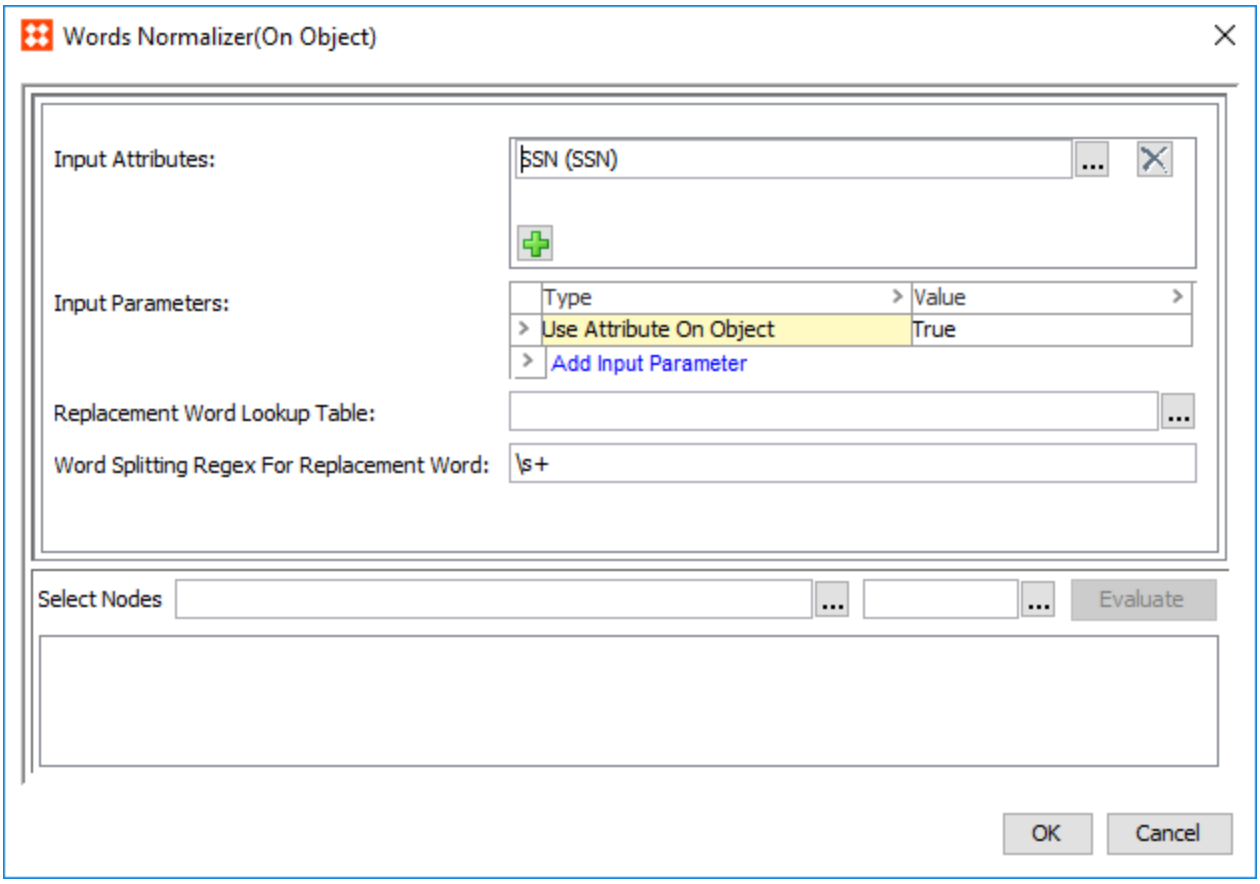
   Note: In order to use this parameter, write a JavaScript address normalizer that outputs a Country ISO code.

7. Click **OK** when finished.

Words Normalizer

A Words Normalizer can normalize attribute data for use in the corresponding Words Matcher. Multiple attributes can be mapped to the same Normalizer. When the corresponding Words Matcher is applied, all mapped attributes will be evaluated.

1. To add a words normalizer, click the ellipsis button (...) in the Data column to access the configuration.



2. For the **Input Attribute** parameter, click the plus sign to create a new entry, then click the ellipsis button (...) and browse or search for attributes whose values should be normalized.
3. Click the **Add Input Parameter** link, and in the Add Input Parameter popup dialog, select the input type from the dropdown.
   - Input Normalizer: Enter the ID of another Words Normalizer to use its output. Typically, this normalizer is written in JavaScript.
   - Data Container: When you select 'Data Container,' click the ellipsis button (...) and browse or search for a data container.
   - Use Attribute on Object: When you select 'Use Attribute On Object,' click the dropdown and select 'True.' This input parameter will normalize the attribute mapped to the **Input Attribute** field. This input parameter will be configured by default.
4. For the **Replacement Lookup Table** parameter, click the ellipsis button (...) and select a lookup table. Typically, this is used to remove invalid values.
5. For the **Name Split Regex** parameter, enter the regex used to split the attribute values into individual words.
6. Click **OK** when finished.

Customer Data JavaScript Normalizers

For especially complicated solutions, it is possible to expand the capabilities of a customer data normalizer via JavaScript. These JavaScript normalizers can be written to input the normalized values of a basic customer data normalizer(s) and manipulate the data in ways the standard normalizer could not. In other words, a JavaScript normalizer inputs a set of strings / values from a basic customer data normalizer and outputs a new set of strings / values.

Note: The JavaScript normalizer should output a completely new set of strings / values, and should not overwrite existing strings / values.

These normalizers can also be built completely from scratch rather than enhancing an existing customer data normalizer.

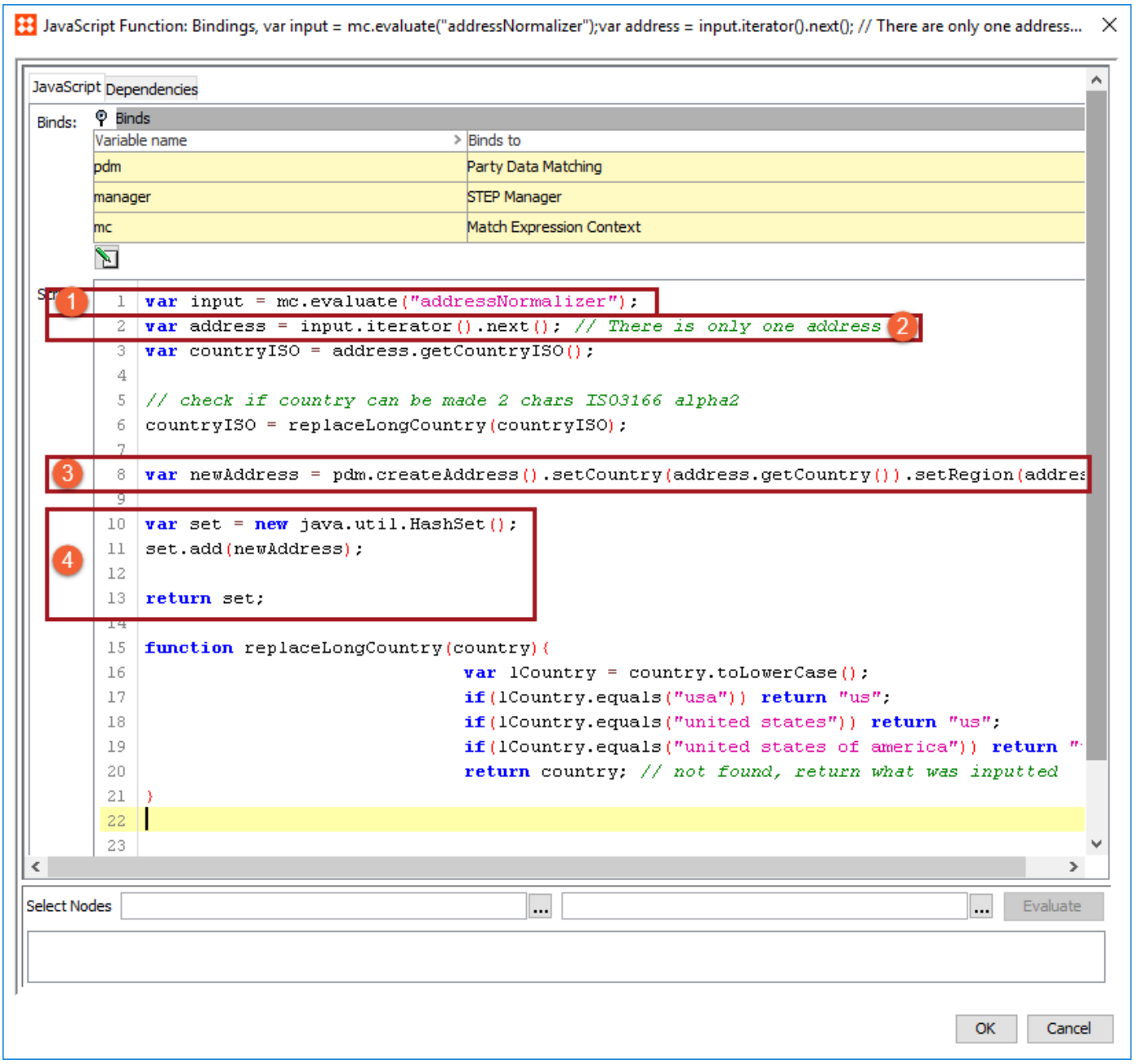
In many situations the more complex JavaScript normalizer would be cited by a corresponding matcher, rather than the basic costumer data normalizer.

A typical customer data JavaScript normalizer complies with the following steps:

1. Use mc.evaluate to retrieve the output of a desired normalizer of the same kind.

Note: 'mc' is a bind to the match expression context.

2. Use an iterator to access the set of values / strings.
3. Use a builder pattern to create new values / strings from the iterated data.
4. Insert the new values / strings into something that can be iterated, such as a set, and return that set.

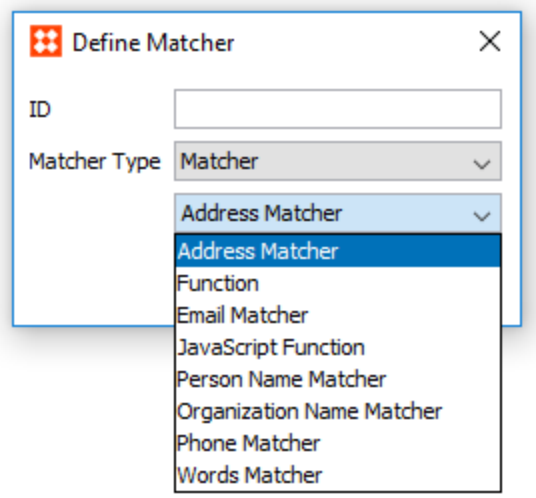

JavaScript Function: Bindings, var input = mc.evaluate("addressNormalizer");var address = input.iterator().next(); // There are only one address...
JavaScript
Dependencies
Binds:
Binds
Variable name
Binds to
pdm
Party Data Matching
manager
STEP Manager
mc
Match Expression Context
1
2
3
4
var input = mc.evaluate("addressNormalizer");
var address = input.iterator().next(); // There is only one address
var countryISO = address.getCountryISO();
// check if country can be made 2 chars ISO3166 alpha2
countryISO = replaceLongCountry(countryISO);
var newAddress = pdm.createAddress().setCountry(address.getCountry()).setRegion(addres
var set = new java.util.HashSet();
set.add(newAddress);
return set;
function replaceLongCountry(country){
var lCountry = country.toLowerCase();
if(lCountry.equals("usa")) return "us";
if(lCountry.equals("united states")) return "us";
if(lCountry.equals("united states of america")) return "
return country; // not found, return what was inputted
}
Select Nodes
Evaluate
OK
Cancel

Decision Table Matchers

Matchers take data from two objects, apply matching logic to them, and output a rank score. Matchers can be written in JavaScript or as STEP functions.

Predefined customer data normalizer templates are also available for those with the required license. For more information on this license, ask your system administrator.

If required, Matchers can be organized into sub tables for especially complex configurations. For more information on sub tables, see the **Decision Tables** section of this documentation.

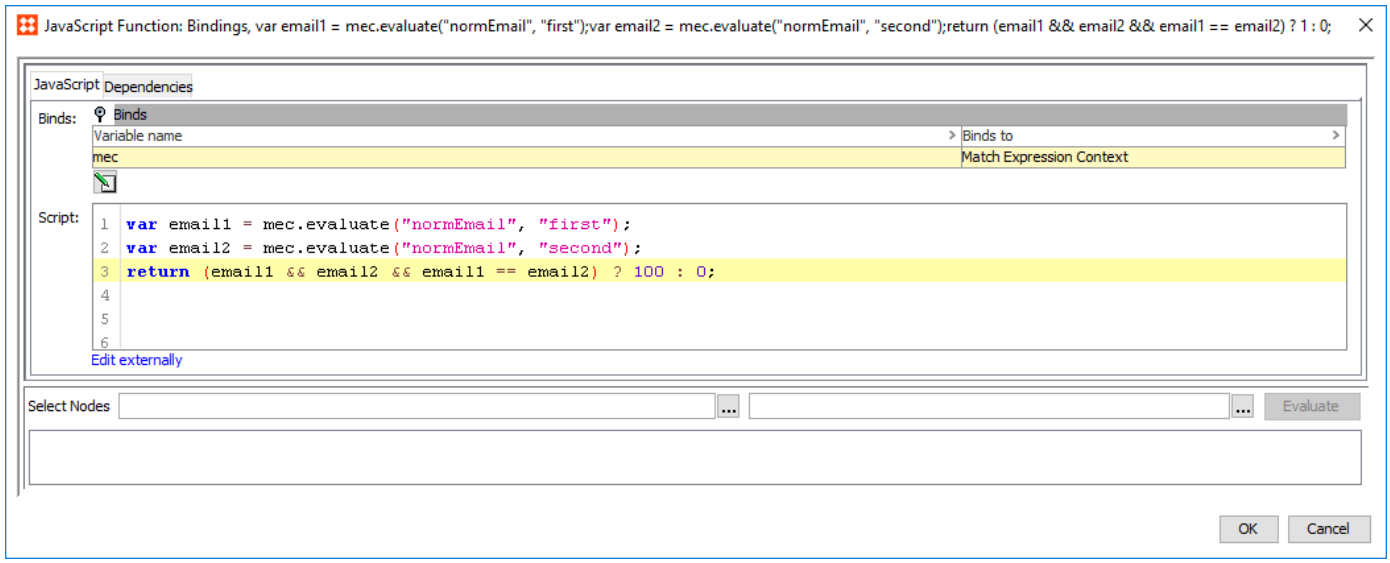


Standard Matchers

When created as a JavaScript or STEP function, 'mcevaluate' and 'evaluate' are used to assess elements from the Data and Matcher sections of the decision table, and compare their results.

Standard Matchers include:

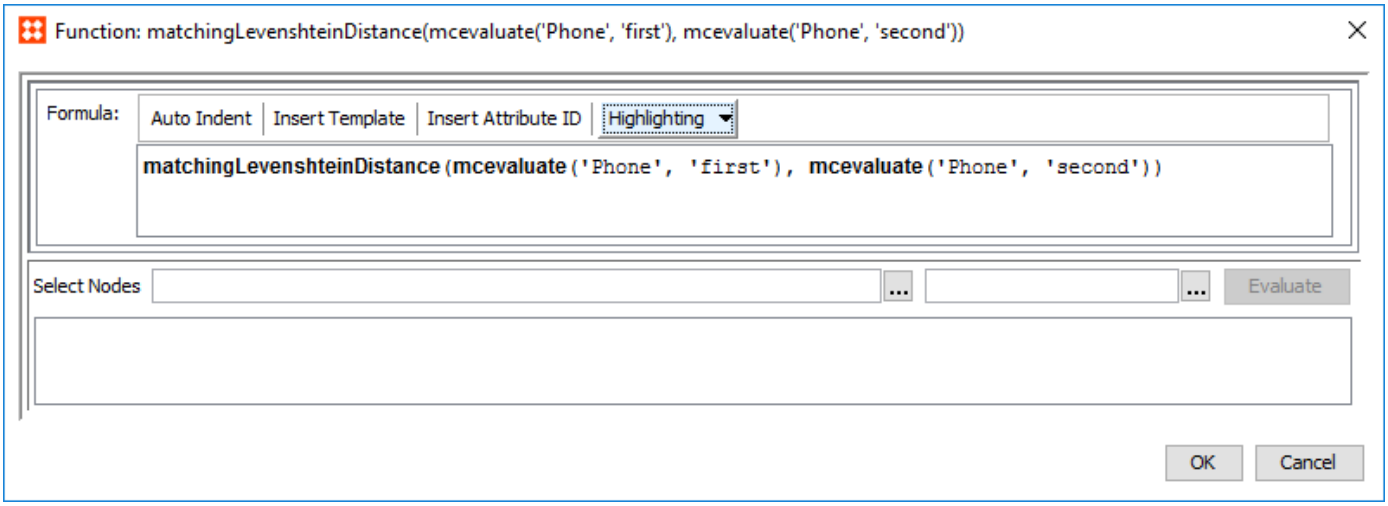
- JavaScript Function



This JavaScript matcher implements a basic email matcher: It performs a plain comparison of the emails by comparing the normalized emails as text strings.

Note: The matcher does not deal with any special cases such as where the normalizer returns strings that are obviously not emails e.g., empty strings. Resolving such cases is expected to be handled by the Email Normalizer.

- STEP Function



Customer Data Matchers

These matcher templates are intended for use in customer data solutions:

- Address Matcher
- Email Matcher

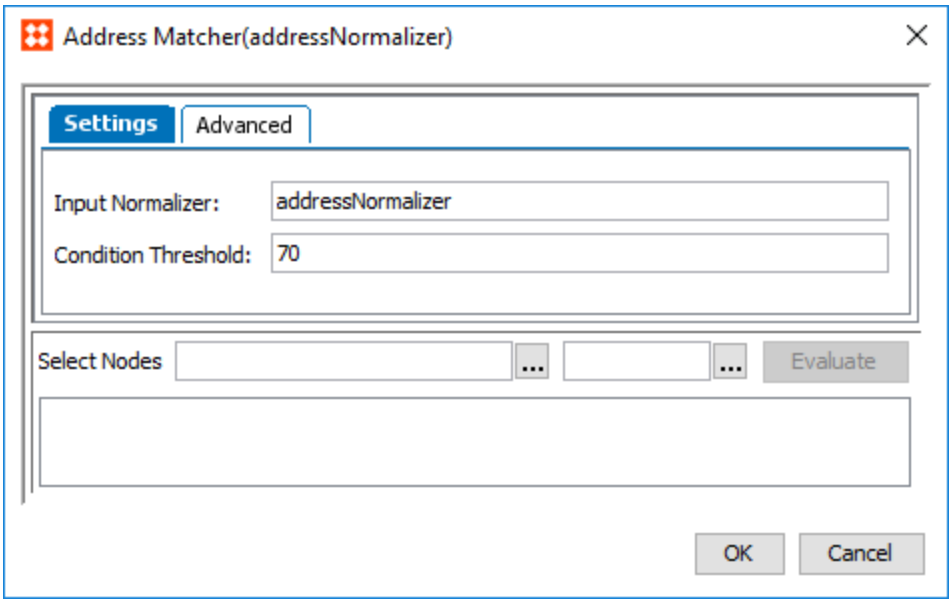
- Organization Name Matcher
- Person Name Matcher
- Phone Matcher
- Words Matcher

Some matchers give access to lookup tables. For more information on lookup tables, see the **Transformation Lookup Tables** topic in **Resource Materials** online help.

Address Matcher

The Address Matcher compares the normalized address data of two objects and outputs a rank score based on the weighted sum of relevant data elements and match factors. When applied to a rule, the resulting rank score is evaluated against a condition threshold, and returns 'True' if it meets or exceeds the minimum requirement of the threshold. If the combination of street and postcode, or street and city is a match, the Address Matcher will return a rank score indicating a match.

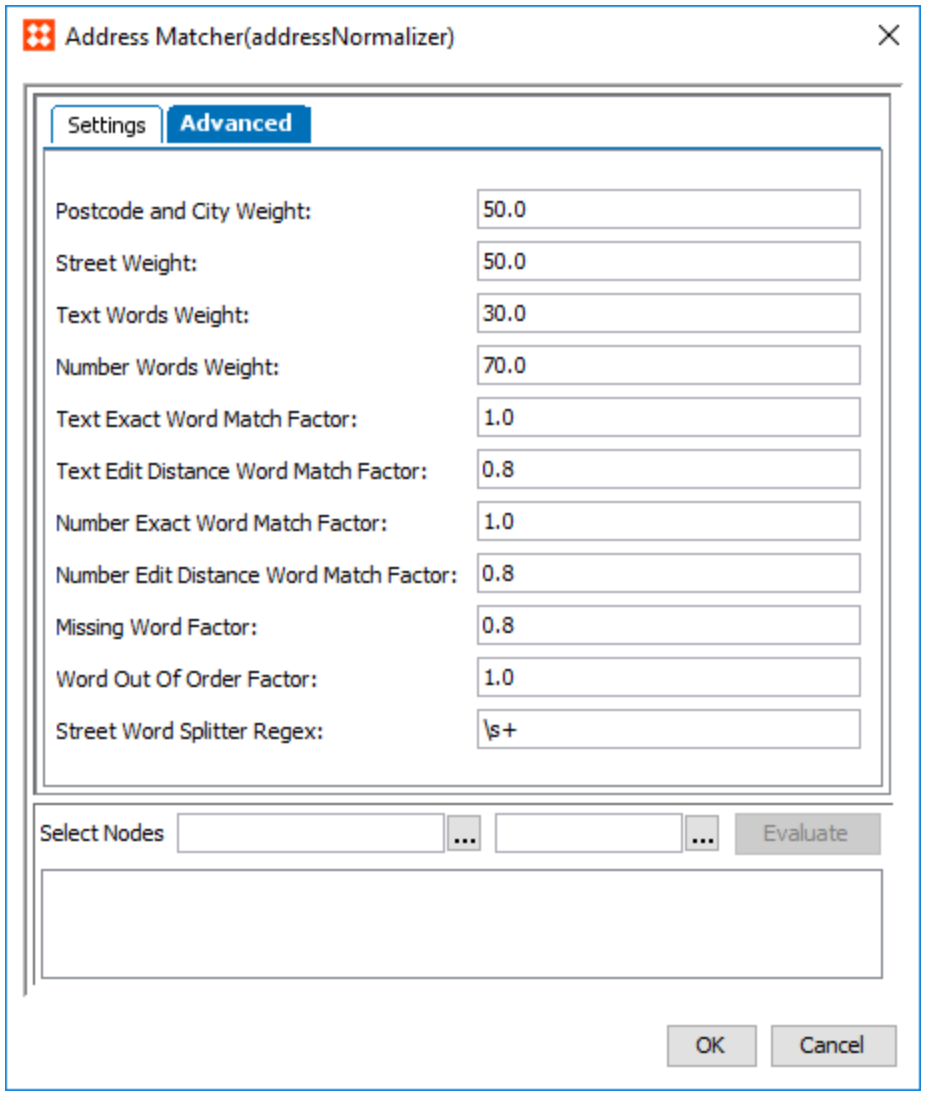
The Address Matcher configuration is split into two tabs: Settings, where the corresponding normalizer is mapped and the condition threshold is established, and Advanced, where different weights are applied to the relevant data elements and match factors.



1. To configure a matcher for customer address data, click the ellipsis button (...) in the Matcher column to access the configuration.
2. The Address Matcher configuration dialog will open in the 'Settings' tab.
3. In the **Input Normalizer** parameter, enter the ID of the address normalizer the matcher applies to. This field is case sensitive.
4. In the **Condition Threshold** parameter, enter the minimum score a matcher must achieve in order to return 'True' on a decision table rule. By default this score is set to '70.'

Note: An empty Condition Threshold should be used if a variable threshold is required between different rules. For example, one rule requires the matcher to return a score greater than '70,' and another rule needs it to be greater than '75.'

5. Navigate to the 'Advanced' tab. All but one of the parameters included on this tab require that a weight be defined. The matcher considers the individual weights of these elements when they are factored together for the rank score.



A few things to note:

- The final score is a weighted sum of street and postcode, or street and city.
- The value of Street is split into individual words based on the **Street Word Splitter Regex**.
- The words for the Street value are split between numbers and text, and are compared separately.

- Text words are paired up using Exact, Metaphone3, and Edit Distance. Text words that are not paired are handled as Missing words.
- Number words are paired up using Exact and Edit Distance. Number words that are not paired are handled as Missing Words.

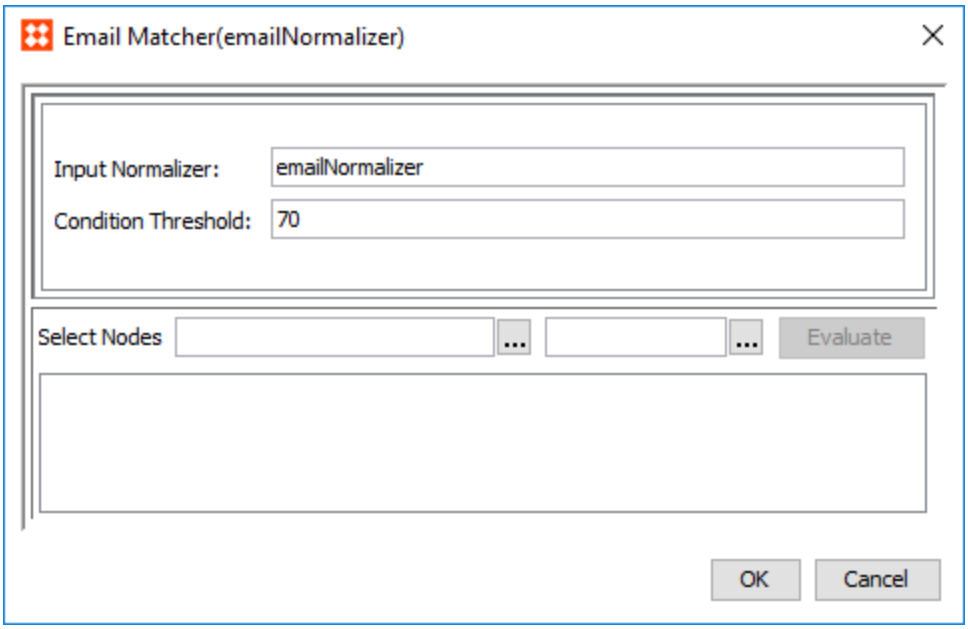
Required parameters include:

- **Postcode and City Weight:** The relative weight of the Postcode / City score versus the Street score.
- **Street Weight:** The relative weight of the Street score versus the Postcode / City. The Street score is a weighted sum of the Number Words score and the Text Words score
- **Text Word Weight:** The relative weight of the Text Words score versus the Number Words score.
- **Number Words Weight:** The relative weight of the Number Words score versus the Text Words score.
- **Text Exact Word Match Factor:** Determines how pairs that are exact matches should influence the final score.
- **Text Edit Distance Word Match Factor:** Determines how words that are paired via edit distance influence the final score.
- **Number Exact Word Match Factor:** Determines how pairs that are exact matches should influence the final score.
- **Number Edit Distance Word Match Factor:** Determines how words that are paired via edit distance influence the final score.
- **Missing Word Factor:** Determines how much unpaired / missing words should penalize the final result.
- **Word Out Of Order Factor:** Determines how much words that appear out of order should penalize the final result.

6. In the **Street Word Splitter Regex** parameter, enter the regex used to split the Street value into words.
7. Click **OK** when finished.

Email Matcher

The Email Matcher compares the normalized email data of two objects and outputs a rank score. When applied to a rule, the resulting rank score is evaluated against a condition threshold, and returns 'True' if it meets or exceeds the minimum requirement of the threshold. If the email values are a match, the Email Matcher will return a rank score indicting a match.



1. To configure a matcher for customer email data, click the ellipsis button (...) in the Matcher column to access the configuration.
2. In the **Input Normalizer** parameter, enter the ID of the email normalizer this matcher applies to. This field is case sensitive.
3. In the **Condition Threshold** parameter, enter the minimum score a matcher must achieve in order to return 'True' on a decision table rule. By default this score is set to '70.'

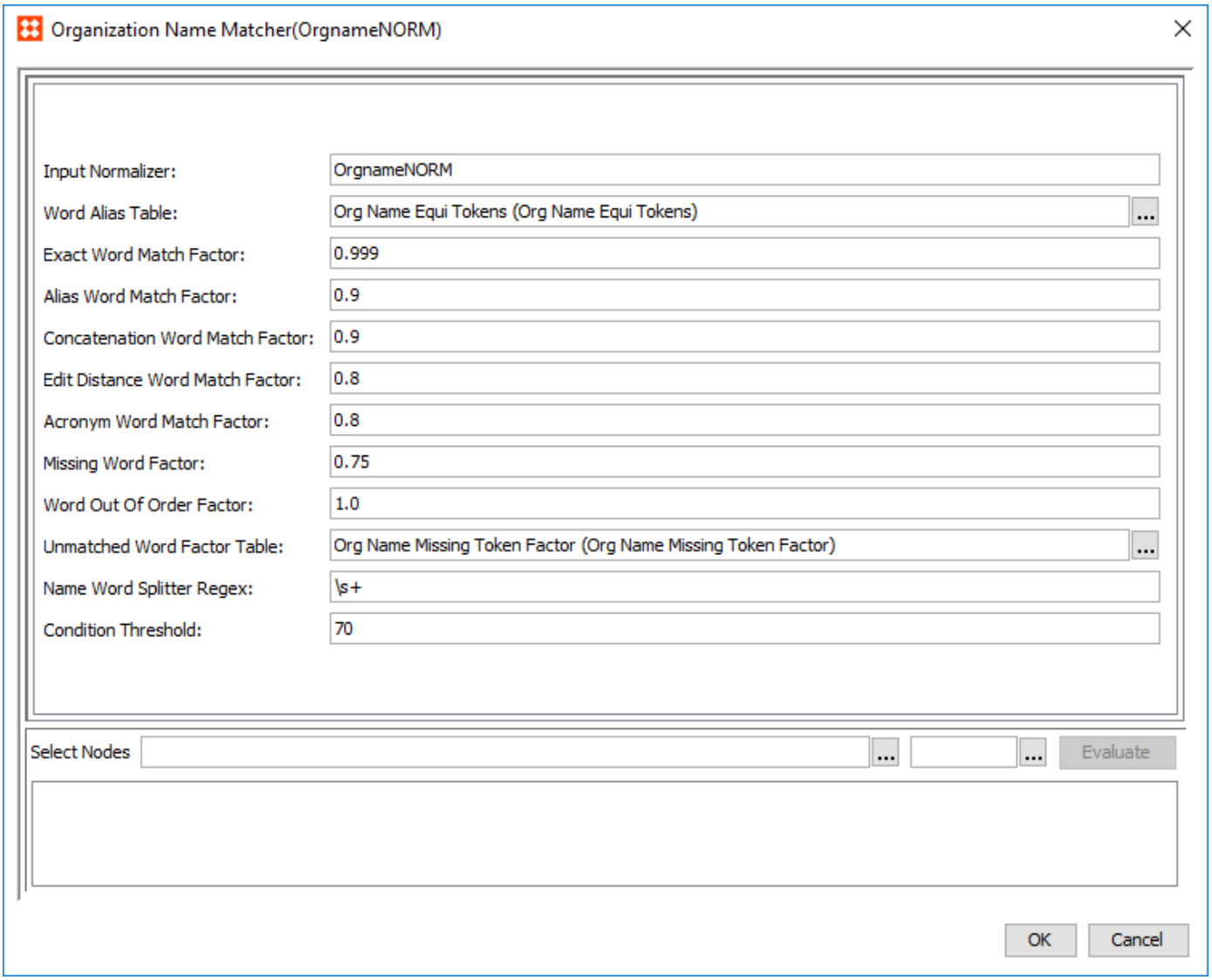
   Note: An empty Condition Threshold should be used if a variable threshold is required between different rules. For example, one rule requires the matcher to return a score greater than '70,' and another rule needs it to be greater than '75.'

4. Click **OK** when finished.

Organization Name Matcher

The Organization Name Matcher compares the normalized organization name data of two objects and outputs a rank score based on the weighted sum of relevant data elements and match factors. When applied to a rule, the resulting rank score is evaluated against a condition threshold, and returns 'True' if it meets or exceeds the minimum requirement of the threshold. If the organization name values are a match, the Organization Name Matcher will return a rank score indicting a match.

1. To configure a matcher for organization name data, click the ellipsis button (...) in the Matcher column to access the configuration.



2. In the **Input Normalizer** parameter, enter the ID of the organization name normalizer this matcher applies to. This field is case sensitive.
3. In the **Word Alias Table** parameter, click the ellipsis button (...) and select a lookup table to use for substituting certain words. This substitution takes place after the string has been cut into individual words via the Splitter Regex. This parameter should be used to match words that have the same or similar meaning. For example, legal terms: *inc* and *incorporated*.
4. In the **Exact Word Match Factor** parameter, determine how pairs that are exact matches should influence the final score.
5. In the **Alias Word Match Factor** parameter, determine how words paired together via aliases should influence the final score.

6. In the **Concatenation Word Match Factor** parameter, determine how concatenated organization names paired with non-concatenated organization names impact the final score. For example, this match factor could be configured to match *ACME Systems* with *ACMESystems*.
7. In the **Edit Distance Word Match Factor** parameter, determine how words that are paired via edit distance influence the final score. Typically this match factor is used to catch spelling errors.
8. In the **Acronym Word Match Factor** parameter, determine how an organization name paired together based off of an acronym influences the final score. For example, the acronym *ACME America Inc.* could be matched with the organization name *Advanced Cellular Medical Engineering of America*.
9. In the **Missing Word Factor** parameter, determine how much unpaired / missing words should penalize the final result.
10. In the **Word Out Of Order Factor** parameter, determine how much words that appear out of order should penalize the final result.
11. In the **Unmatched Word Factor Table** parameter, click the ellipsis button (...) and select the relevant lookup table.

Note: The Unmatched Word Factor Table is a lookup table that assigns factors to certain words.

By default, unpaired / missing words will penalize the final score using the Missing Word Factor parameter. However, if an unpaired / missing word appears in this table, it will penalize the final score using the factor in the table rather than the factor configured in Missing Word Factor parameter. This can be used to reduce or increase the penalty that certain words, depending on their significance, have on the final score if they are missing.

12. In the **Name Word Splitter Regex** parameter, enter the regex used to split the Organization Name value into words.
13. In the **Condition Threshold** parameter, enter the minimum score a matcher must achieve in order to return 'True' on a decision table rule. By default this score is set to '70'.

Note: An empty Condition Threshold should be used if a variable threshold is required between different rules. For example, one rule requires the matcher to return a score greater than '70,' and another rule needs it to be greater than '75.'

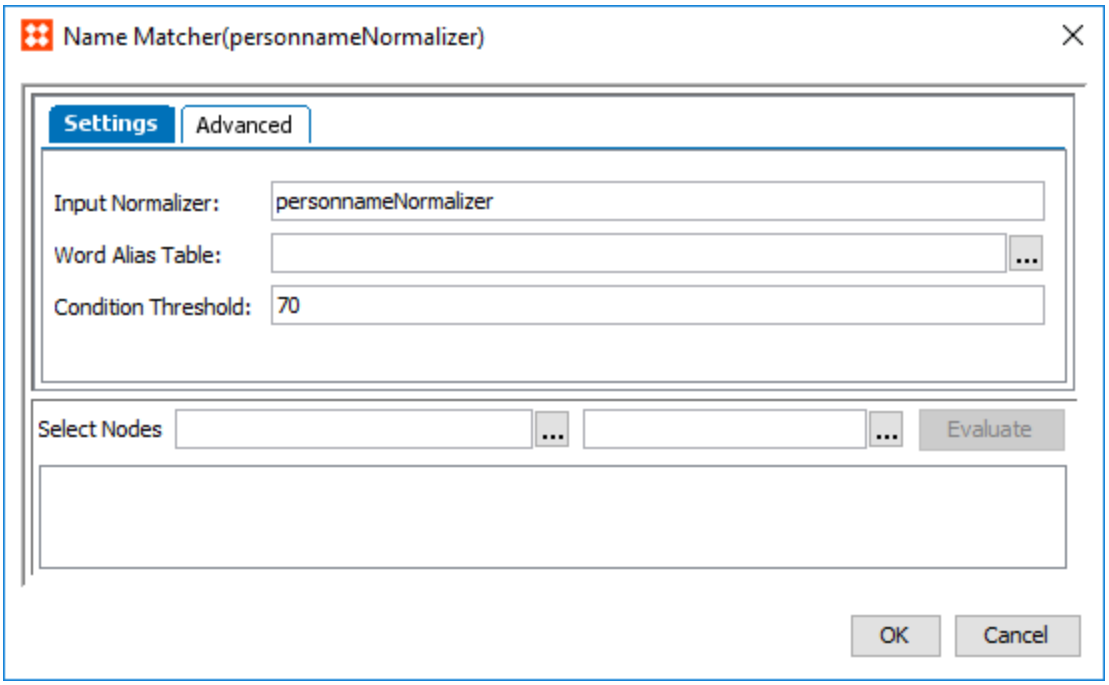
14. Click **OK** when finished.

Person Name Matcher

The Person Name Matcher compares the normalized name data of two objects and outputs a rank score based on the weighted sum of relevant data elements and match factors. When applied to a rule, the resulting rank score is evaluated against a condition threshold, and returns 'True' if it meets or exceeds the minimum requirement of the threshold. If the combination of first name and middle name, and middle name and last name is a match, the Person Name Matcher will return a rank score indicating a match.

Note: If customer names are represented in a single field rather than split into First and Last, use the Words Normalizer / Matcher instead. Middle Name is not required to use this matcher.

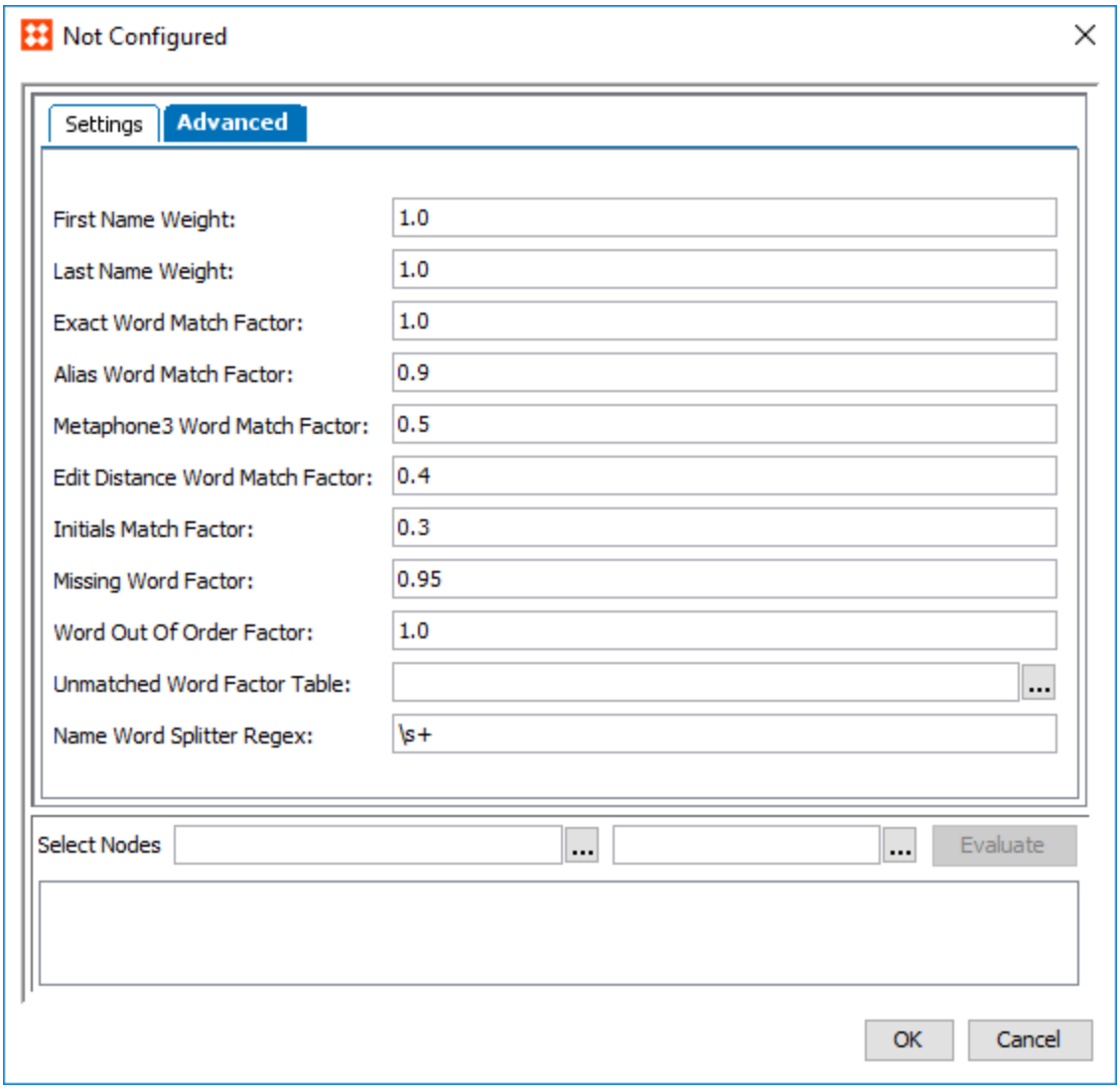
The Person Name Matcher configuration is split into two tabs: Settings, where the corresponding normalizer is mapped and the condition threshold is established, and Advanced, where different weights are applied to the relevant data elements and match factors



1. To configure a matcher for customer name data, click the ellipsis button (...) in the Matcher column to access the configuration.
2. The Person Name Matcher configuration dialog will open in the 'Settings' tab.
3. In the **Input Normalizer** parameter, enter the ID of the person name normalizer this matcher applies to. This field is case sensitive.
4. In the **Word Alias Table** parameter, click the ellipsis button (...) and select a lookup table to use for substituting certain words. This substitution takes place after the string has been cut into individual words via the Splitter Regex.
5. In the **Condition Threshold** parameter, enter the minimum score a matcher must achieve in order to return 'True' on a decision table rule. By default this score is set to '70'.

   Note: An empty Condition Threshold should be used if a variable threshold is required between different rules. For example, one rule requires the matcher to return a score greater than '70,' and another rule needs it to be greater than '75.'

6. Navigate to the 'Advanced' tab. All but two of the parameters included on this tab require that a weight be defined. The matcher considers the individual weights of these elements when they are factored together for the rank score.



A couple things to note:

- The final score is a weighted sum of the combined first name and middle name, and the combined middle name and last name.
- The First Name, Middle Name, and Last Name values are split into individual words based on the **Name Word Splitter Regex**.

Required parameters include:

- **First Name Weight:** The relative weight of the First Name / Middle Name score versus the Middle Name / Last Name score.

- **Last Name Weight:** The relative weight of the Middle Name / Last Name score versus the First Name / Middle Name score.
- **Exact Word Match Factor:** Determines how pairs that are exact matches should influence the final score.
- **Alias Word Match Factor:** Determines how words paired together via aliases should influence the final score.
- **Metaphone3 Word Match Factor:** Determines how words paired together via metaphone3 should influence the final score.
- **Edit Distance Word Match Factor:** Determines how words that are paired via edit distance influence the final score.
- **Initials Match Factor:** Determines how words paired together via initials influence the final score.
- **Missing Word Factor:** Determines how much unpaired / missing words should penalize the final result.
- **Word Out Of Order Factor:** Determines how much words that appear out of order should penalize the final result.

7. In the **Unmatched Word Factor Table** parameter, click the ellipsis button (...) and select the relevant lookup table.

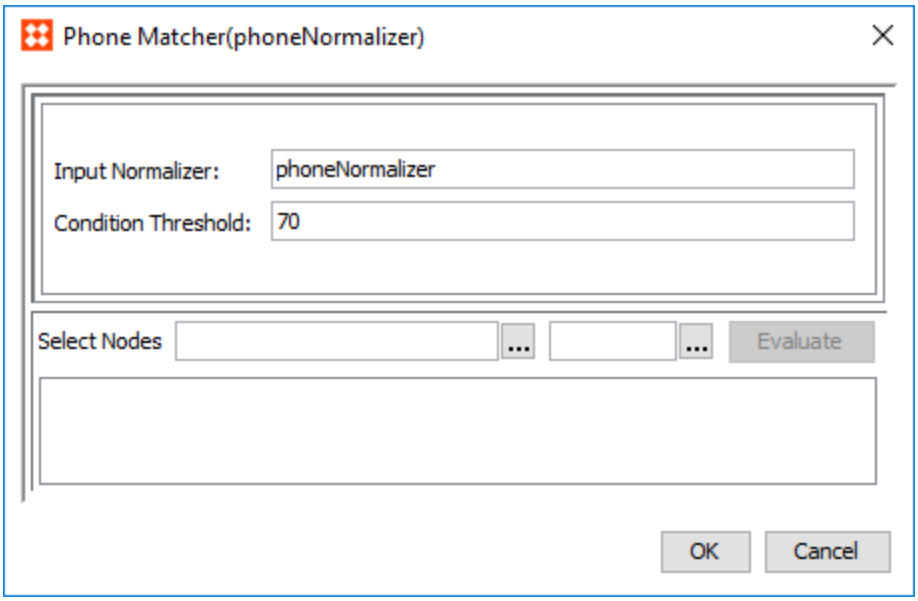
Note: The Unmatched Word Factor Table is a lookup table that assigns factors to certain words.

By default, unpaired / missing words will penalize the final score using the Missing Word Factor parameter. However, if an unpaired / missing word appears in this table, it will penalize the final score using the factor in the table rather than the factor configured in Missing Word Factor parameter. This can be used to reduce or increase the penalty that certain words, depending on their significance, have on the final score if they are missing.

8. In the **Name Word Splitter Regex** parameter, enter the regex used to split the First Name, Middle Name, and Last Name values into words.
9. Click **OK** when finished.

Phone Matcher

The Phone Matcher compares the normalized phone data of two objects and outputs a rank score. When applied to a rule, the resulting rank score is evaluated against a condition threshold, and returns 'True' if it meets or exceeds the minimum requirement of the threshold. If the phone values are a match, the Phone Matcher will return a rank score indicting a match.



1. To configure a matcher for customer phone data, click the ellipsis button (...) in the Matcher column to access the configuration.
2. In the **Input Normalizer** parameter, enter the ID of the phone normalizer this matcher applies to. This field is case sensitive.
3. In the **Condition Threshold** parameter, enter the minimum score a matcher must achieve in order to return 'True' on a decision table rule. By default this score is set to '70.'

   Note: An empty Condition Threshold should be used if a variable threshold is required between different rules. For example, one rule requires the matcher to return a score greater than '70,' and another rule needs it to be greater than '75.'

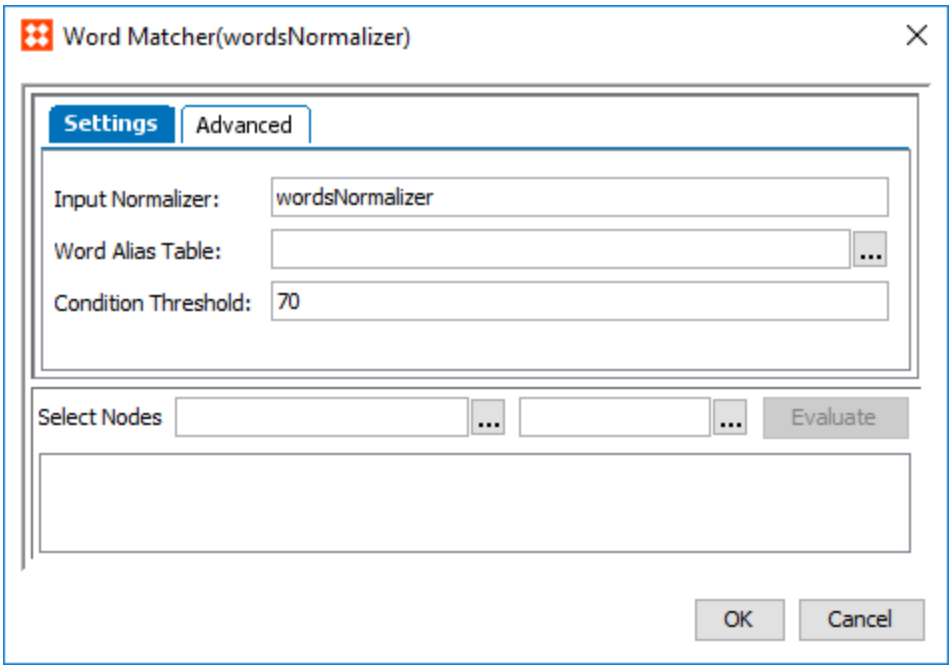
4. Click **OK** when finished.

Words Matcher

The Words Matcher compares the normalized words data of two objects and outputs a rank score based on the weighted sum of relevant data elements and match factors. When applied to a rule, the resulting rank score is evaluated against a condition threshold, and returns 'True' if it meets or exceeds the minimum requirement of the threshold. If the word values are a match, the Words Matcher will return a rank score indicting a match.

Note: The Words Normalizer / Matcher is a generic multi-word matcher that can represent a wide range of data. For example, customer names and social security numbers.

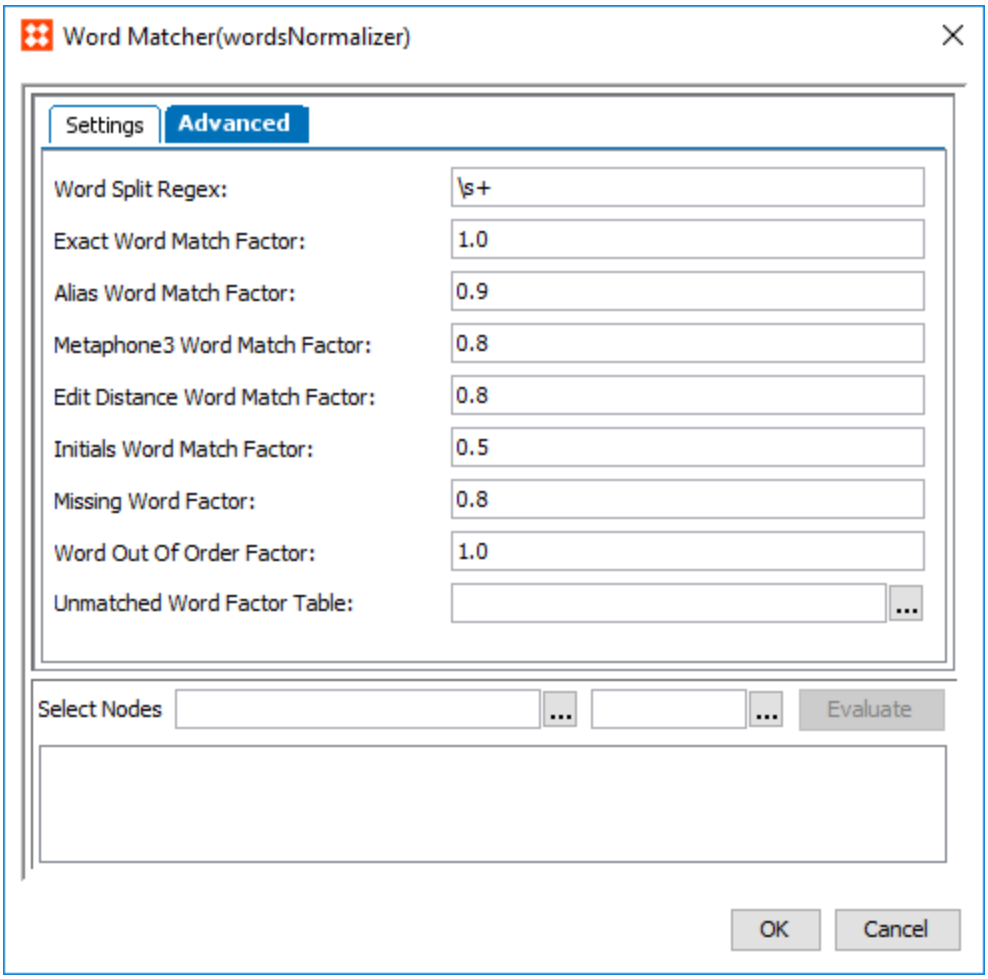
The Words Matcher configuration is split into two tabs: Settings, where the corresponding normalizer is mapped and the condition threshold is established, and Advanced, where different weights are applied to the relevant data elements and match factors



1. To configure a matcher for different word normalizers, click the ellipsis button (...) in the Matcher column to access the configuration.
2. The Words Matcher configuration dialog will open in the 'Settings' tab.
3. In the **Input Normalizer** parameter, enter the ID of the words normalizer this matcher applies to. This field is case sensitive.
4. In the **Word Alias Table** parameter, click the ellipsis button (...) and select a lookup table to use for substituting certain words. This substitution takes place after the string has been cut into individual words via the Splitter Regex.
5. In the **Condition Threshold** parameter, enter the minimum score a matcher must achieve in order to return 'True' on a decision table rule. By default this score is set to '70.'

   Note: An empty Condition Threshold should be used if a variable threshold is required between different rules. For example, one rule requires the matcher to return a score greater than '70,' and another rule needs it to be greater than '75.'

6. Navigate to the 'Advanced' tab. All but two of the parameters included on this tab require that a weight be defined. The matcher considers the individual weights of these elements when they are factored together for the rank score.



7. In the **Word Splitter Regex** parameter, enter the regex used to split the Word values into separate words.
8. Required weighed parameters include:
   - **Exact Word Match Factor:** Determines how pairs that are exact matches should influence the final score.
   - **Alias Word Match Factor:** Determines how words paired together via aliases should influence the final score.
   - **Metaphone3 Word Match Factor:** Determines how words paired together via metaphone3 should influence the final score.
   - **Edit Distance Word Match Factor:** Determines how words that are paired via edit distance influence the final score.
   - **Initials Match Factor:** Determines how words paired together via initials influence the final score.
   - **Missing Word Factor:** Determines how much unpaired / missing words should penalize the final result.
   - **Word Out Of Order Factor:** Determines how much words that appear out of order should penalize the final result.

9. In the **Unmatched Word Factor Table** parameter, click the ellipsis button (...) and select the relevant lookup table.

Note: The Unmatched Word Factor Table is a lookup table that assigns factors to certain words.

By default, unpaired / missing words will penalize the final score using the Missing Word Factor parameter. However, if an unpaired / missing word appears in this table, it will penalize the final score using the factor in the table rather than the factor configured in Missing Word Factor parameter. This can be used to reduce or increase the penalty that certain words, depending on their significance, have on the final score if they are missing.

10. Click **OK** when finished.

Customer Data JavaScript Matchers

For especially complicated solutions, it is possible to expand the capabilities of a customer data matcher via JavaScript. These work in much the same way as basic customer data matchers, but allow for more flexibility and expanded functionality.

A typical customer data JavaScript matcher complies with the following basic steps:

1. Use mc.evaluate to retrieve the output of a desired normalizer.

   Note: 'mc' is a bind to the match expression context.

2. Use an iterator to access the set of values / strings of both objects being matched.
3. Compare those objects and output a rank score.

For more information on customer data JavaScript normalizers, see the **Decision Table Normalizers** section of the documentation.

Matching, Linking, and Merging JavaScript Binds

First Match Object and Second Match Object

When used in a Find Similar matching algorithm, the First Match Object and Second Match Object binds are used to search for similar objects across a reference. For example, when searching for a similar address on a contact, when addresses are linked to contacts by a reference.

Outside of Find Similar, for performance considerations avoid using this binding. Instead, use the 'Match Expression Context' to obtain values via global binds.

For more information on global binds, see the **Match Criteria** documentation.

For more information on Find Similar functionality, see the **Find Similar** section of the **Using a Web UI** documentation.

Matching Functions

When bound to a variable, the variable will hold an object that has the following member functions:

Matching Functions	Header Row
Levenshtein and Damerau-Levenshtein Distance Functions	• damerauLevenshteinDistance(string1, string2) • damerauLevenshteinDistanceLimited(string1, string2, limit) • levenshteinDistance(string1, string2) • levenshteinDistanceLimited(string1, string2 , limit)
Soundex	• soundex(string)
Metaphone3	• metaphone3(string) • metaphone3alternate(string)

The Levenshtein and Damerau-Levenshtein Distance Functions

The Levenshtein and Damerau-Levenshtein distance functions work as described in the **Match Criteria** topic. Additionally, each function has a variant which allows you to specify a maximum number of edits that can be returned (limit defined as an integer).

For more information on the Levenshtein and Damerau-Levenshtein distance functions, see the **Match Criteria** documentation.

Soundex

Soundex is a phonetic algorithm for indexing names by sound, as pronounced in English. In practice the function allows you to generate a four character code from a string, where the code is the phonetic representation.

For more information on Soundex, see the **Text Functions** section in the **Resource Materials** online help.

Metaphone3

Metaphone 3 is an improved version of Soundex.

For more information on Metaphone3, see the **Text Functions** section in the **Resource Materials** online help.

Match Expression Context

Can be used to reference global bind values from a pure JavaScript criterion.

For more information on global binds, see the **Match Criteria** documentation.

Lookup Table Home

When bound to a variable, the variable will hold an object that allows you to work with transformation lookup tables from the script. The interface has a single public method that returns a String containing either the lookup value or the original value if no match could be made:

```
getLookupTableValue(String assetID, String value)
```

- The first argument is the ID (string) of the lookup table, which is an asset.
- The second argument is the string for which you want to get the lookup value.

For more information, see the **Using JavaScript with Lookup Tables** topic and the **Transformation Lookup Tables** topic in the **Resource Materials** documentation.

STEP Manager

When bound to a variable, the variable will hold a STEP Manager, i.e., the gateway to the public Java API.

If desired, you could implement the entire algorithm for comparing objects using just the JavaScript criterion and have it as complex as required.

For more information, see the **STEP Manager Bind** section in the **Resource Materials** online help.

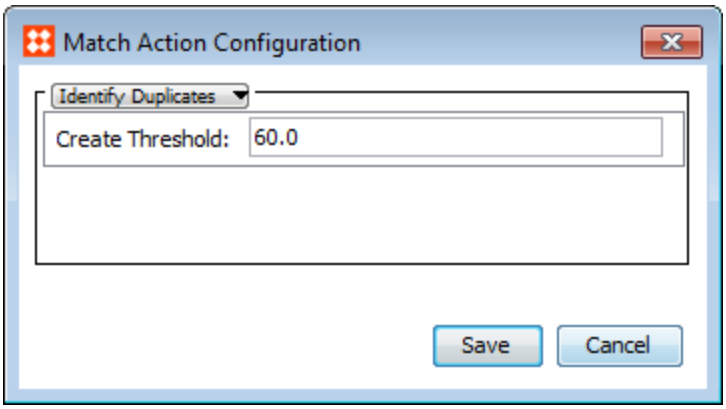
For an example of this functionality with JavaScript, see the online version of this topic.

A disadvantage to formulating the logic using JavaScript is that it may be difficult to decipher for other users, particularly for those unfamiliar with JavaScript. Thus, another option for formulating complex logic is available via the Decision Table criterion. For more information, see the **Decision Table** section of the documentation.

Identify Duplicates Match Action

The Identify Duplicates Match Action allows for the identification of duplicates without automatically applying any actions to those records.

The only parameter required when configuring this match action is a threshold specifying how equal objects have to be in order to be identified as possible duplicates.



For more information on configuring a matching algorithm with this match action, see the **Configuring Matching Algorithms Overview** documentation.

When a matching algorithm configured with this match action is applied, the possible matches can be inspected from the matching algorithm object.

If two objects are manually confirmed as being duplicates, a reference will be created between them. The existence of such a reference means that regardless of how the objects are modified, the matching algorithm will always see them as duplicates. The reference type configured as the 'Duplicate Type' on the matching algorithm is used in this case.

Similarly, possible duplicates can be rejected, creating a reference between them. With such a reference, the two objects will never be identified as duplicates by the matching algorithm regardless of how they are modified. The reference type configured as the 'Non-Duplicate Type' on the matching algorithm is used in this case.

In both of the above cases the references can be manually removed via the 'References' tab of the object in question.

If two objects are confirmed duplicates, it is possible to manually merge them into a single object. When performing a merge, you can decide which object will survive the merge and what data that object will inherit from the object being deleted.

For more information, see the **Handling Potential Duplicates** documentation.

Golden Records Survivorship Rules

A golden record's attribute and reference data is copied from contributing objects automatically. What data is copied from which object is determined by 'Survivorship Rules' set on the applicable matching algorithm. These rules can be defined independently for an object's name, its references, its data containers, and its attributes / attribute groups. A default comprehensive rule exists for attributes, so it is not necessary to define a rule for each and every attribute / attribute group.

Additionally, the Business Action rule allows the specified business action to run on golden records when survivorship rules are applied.

Note: Survivorship rules are only applicable to Merge Golden Record (where source records are stored outside of STEP) and Link Golden Record (where source records are stored in STEP) configurations. For these two solutions, survivorship rules **must** be configured.

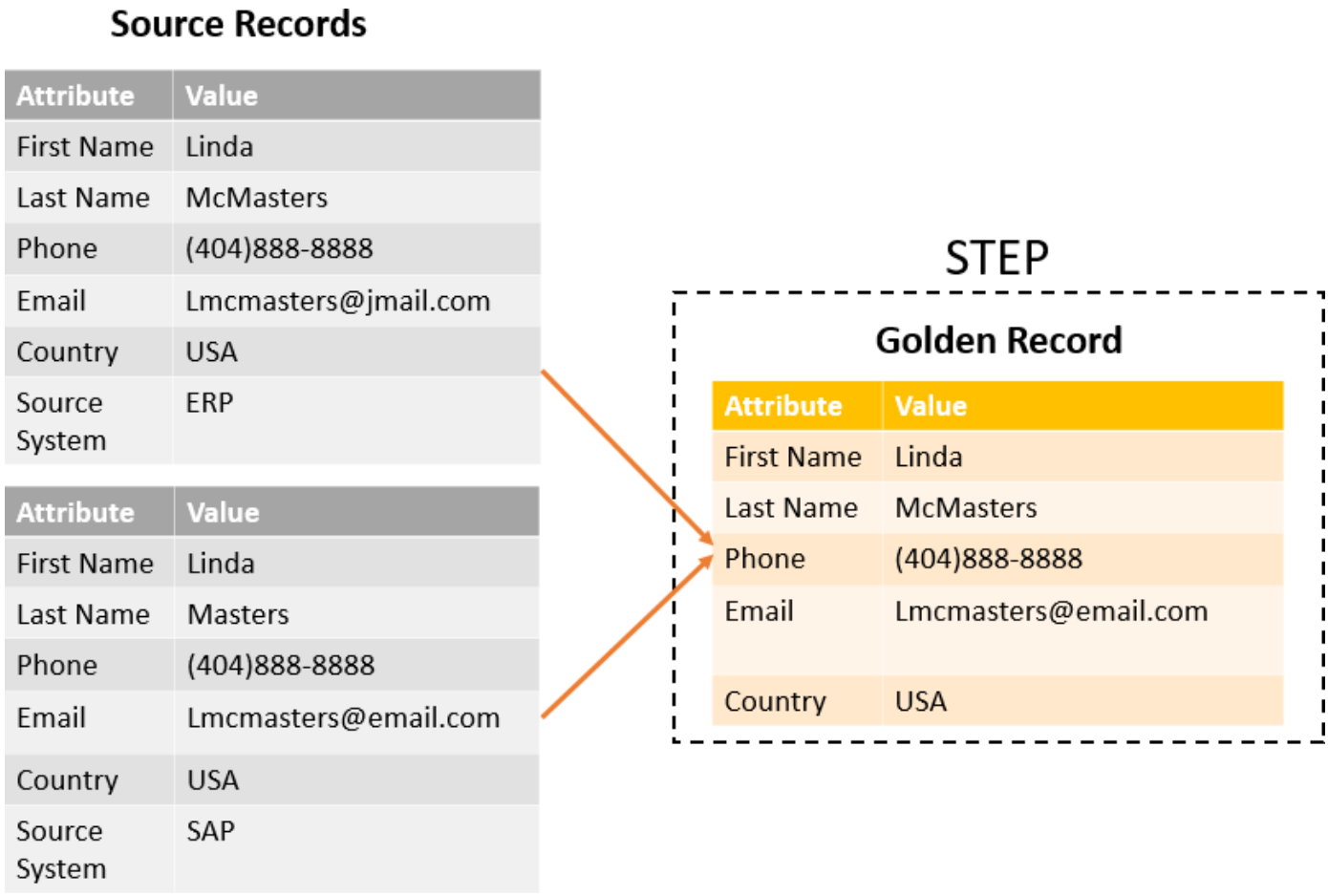
Two concepts are in play when determining which of multiple source objects to take data from:

- Trusted Source
- Most Recent

Trusted Source

Information about the source (such as what system / supplier the object originated from) must be available on the source objects when using the 'Trusted Source' option. Any attribute selected when configuring the matching component model must be populated on the source objects. Typically this should be a required, LOV-based, description attribute that does not allow users to add values.

With this information available, a survivorship rule can be defined that lists the possible sources in the preferred order. Take the example illustrated below where the source objects come from either an ERP or SAP system:



In the image above, a single golden record is produced with data from the 'Linda McMasters' / 'Linda Masters' duplicate pair. The 'Last Name' is taken from the object that comes from the ERP system while 'Email' is taken from the object that comes from the SAP system.

If only trusted source survivorship rules are used, this implies that a rule has been defined for 'Last Name' that favors the ERP source over the SAP source. Additionally, there is a rule that states 'Email' favors the SAP source over the ERP source.

For Link Golden Record solutions, golden records that only reference a single source object will get data from that object, but only if it is listed as a trusted source. Only data that has survivorship rules defined is copied to the golden record.

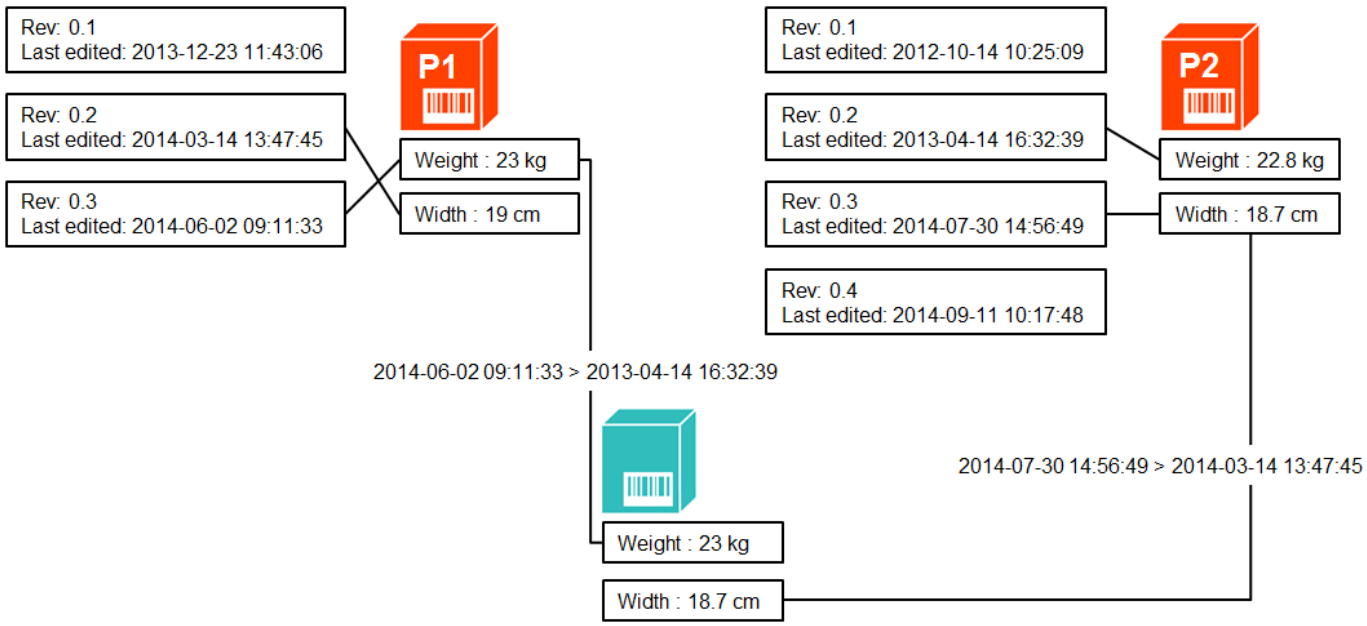
For dimension dependent data within a Link Golden Records solution, use the Multi Context Trusted Source rules for promoting name, reference / link, and value content.

Most Recent

As the name implies, the 'Most Recent' survivorship rule strategy takes the most recent data from a golden record's source objects. While this sounds simple, it is important to note that this does not necessarily mean the source object with the newest revision. Instead, each relevant value is analyzed individually. Those values with the

newest revisions (based on the 'Last Edited' date) are taken from their source objects.

In the image below, two products (P1 and P2) are combined to create one golden record.



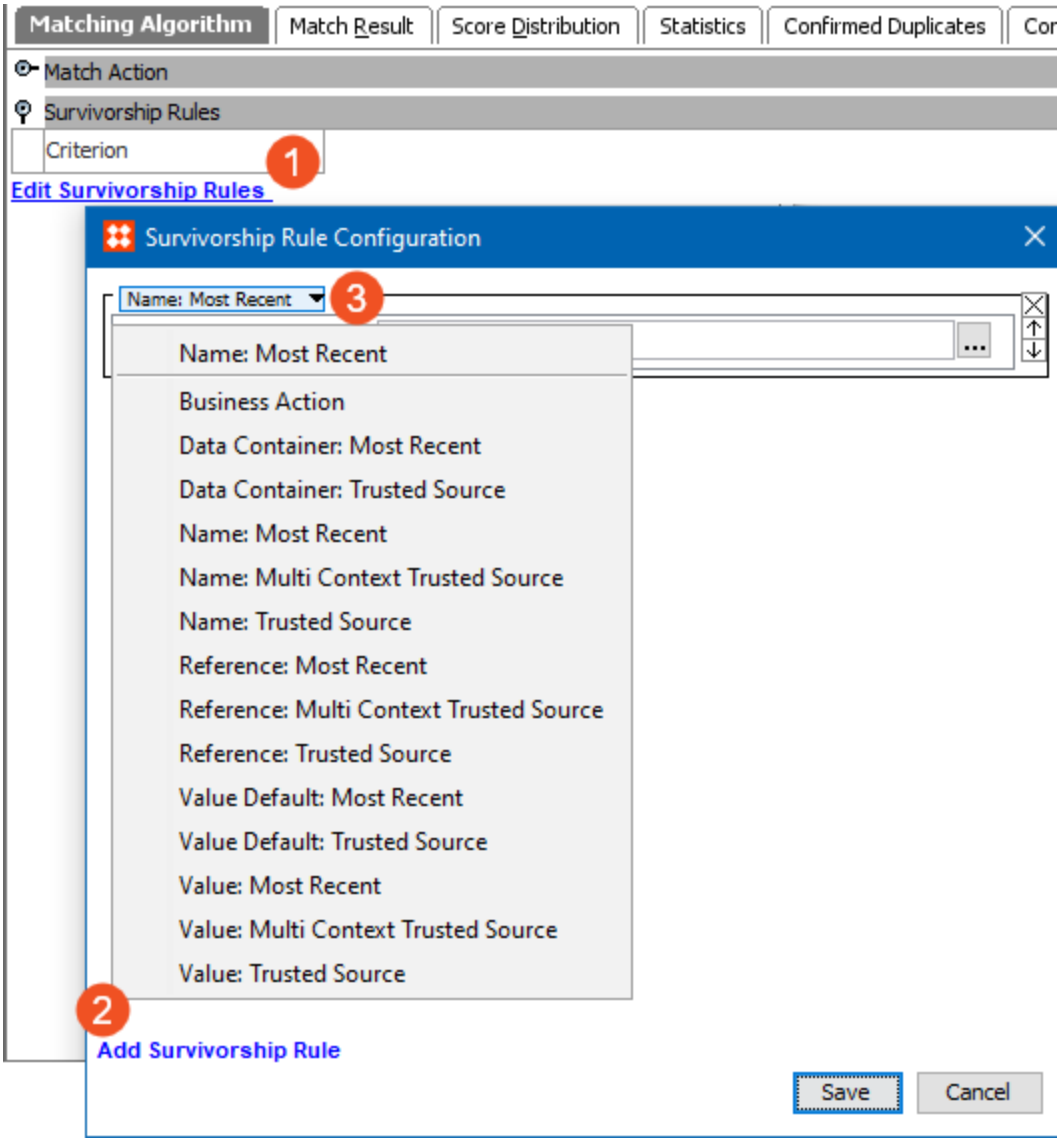
For more information on survivorship strategies, see **Golden Record Survivorship Rule Types**.

Golden Record Survivorship Rule Types

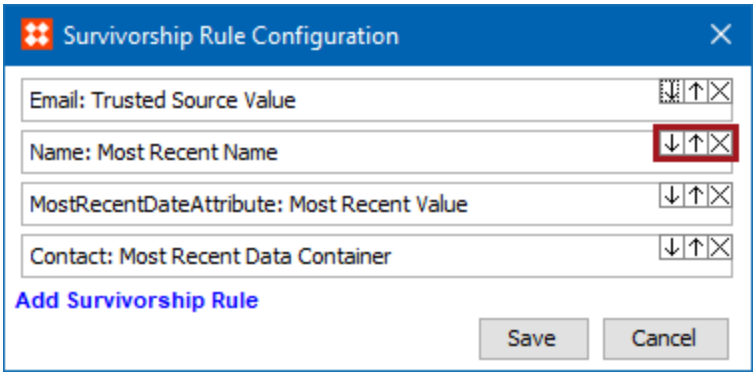
It is possible to use a combination of the 'Most Recent' and 'Trusted Source' strategies so that, for example, the value of one attribute could be copied to the golden record based on a trusted source setup while the other attributes are copied based on which ones were updated most recently. For an overview, see **Golden Records Survivorship Rules**.

Survivorship rules must be used in both matching strategies: Merge Golden Record (where source records are stored outside of STEP) and Link Golden Record (where source records are stored in STEP).

To add a survivorship rule, edit the matching algorithm, open the Survivorship Rules flipper, and click the Edit Survivorship Rules link. In the Survivorship Rule Configuration dialog, click the Add Survivorship Rule link and select the required rule from the dropdown.



When multiple rules are added, they are executed in order from top-to-bottom. Use the down and up buttons to change the order of the rules. Use the X button to remove a rule.



Three types of rules are available: Business Action, Most Recent, and Trusted Source. There are multiple versions of the most recent and the trusted source rules, based on the content being promoted: data containers, name, reference, and value. Each applicable golden record strategy is defined for the available rules below.

Business Action Rule

This rule can be used for Merge or Link strategies. Click the ellipsis button (...) to specify a business action to run on golden records when survivorship rules are applied.

When using a JavaScript business action with the Merge Golden Record solution, it is required to configure a business action with the 'Survivorship Rules Source Object' bind. This bind grants the script access to the temporary source objects so that any relevant values can be promoted from them to the surviving golden records.

Note: When data is promoted to a Golden Record, it is done across all Contexts (the evaluation is performed in the context and workspace selected on the algorithm) and only the data for which Survivorship Rules exist will be promoted. Inherited and calculated values are not used.

Data Container Rules

The following rules are available for promoting data container values to a golden record.

Data Container: Most Recent

This rule can be used for Merge or Link strategies and allows the most recent data container instances and their attribute values to be promoted to the golden records. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers. The following parameters must be configured:

- **Business Condition:** Click the ellipsis button (...) and select a business condition that is valid for the golden record object type. If the source record should always overwrite the golden record, the condition should return true. Otherwise, this condition must be a JavaScript rule that uses the 'Pairs of Attributes' bind to compare data container instances on source records with data container instances on golden records when survivorship

rules are applied. For more information and an example of the bind, see the **Pair of Attribute Values Bind** section in the **Resource Materials** documentation.

- **Data Container Type:** Click the ellipsis button (...) and select the relevant data container type.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Note: Survivorship rules look at Last Edit Date attributes on the entities themselves before they look for them within a data container. Additionally, in the case of multi value data container types, it takes the newest date from all data containers of the type in question.

Data Container: Trusted Source

This rule can be used for Merge or Link strategies and allows data container instances and their attribute values that originate from the specified trusted source(s) to be promoted to the golden records. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers. The following parameters must be configured:

- **Business Condition:** Click the ellipsis button (...) and select a business condition that is valid for the golden record object type. If the source record should always overwrite the golden record, the condition should return true. Otherwise, this condition must be a JavaScript rule that uses the 'Pairs of Attributes' bind to compare data container instances on source records with data container instances on golden records when survivorship rules are applied. For more information and an example of the bind, see the **Pair of Attribute Values Bind** section in the **Resource Materials** documentation.
- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.
- **Data Container Type:** Click the ellipsis button (...) and select the relevant data container type.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Note: Survivorship rules look at Last Edit Date attributes on the entities themselves before they look for them within a data container. Additionally, in the case of multi value data container types, it takes the newest date from all data containers of the type in question.

Name Rules

The following rules are available for an object name to a golden record.

Name: Most Recent

This rule can be used for Merge or Link strategies and it specifies that 'Name' should be taken from the source object with the most recent name. No configuration is required for this rule. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Name: Multi Context Trusted Source

This rule can be used for Link strategy only and considers data that is dimension dependent. The analysis is performed for all contexts / qualifiers (a set of one or more dimension points, like country and language) in STEP. The available parameters determine which name is promoted to the golden record.

- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.
- **Promote single source only:** When checked, the name from the most trusted source is used for all contexts / qualifiers, which prevents an empty name value in the golden record as long as one of the trusted sources has a name. For example, when only the French language, France country context has a name value, that value would be written into all other contexts. Alternatively, when not checked, each context / qualifier supplies its own name, including empty values when found.
- **Prefer dimension point specific names:** When checked, only a local name is promoted. When not checked, available inherited content is promoted if a local name does not exit.

Name: Trusted Source

This rule can be used for Merge or Link strategies and determines that 'name' is taken from the most trusted source. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most

recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Reference Rules

The following rules are available for promoting references / links to a golden record.

Reference: Most Recent

This rule can be used for Merge or Link strategies and it allows selecting the three reference / link types that should be promoted from the source object with the most recent reference / link. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Reference Type:** Required. Click the ellipsis button (...) to specify the valid reference / link type from the source objects you are handling. When this is the only field populated, a reference / link of the same type pointing to the same target will be promoted to the golden record.
- **Golden Record Reference Type:** Optional. If the objects the source objects are pointing to also have golden records, you can configure the new golden record to point to this golden record rather than the source object's original target. Click the ellipsis button (...) to specify the reference type that links the target golden records and target source objects.
- **Mapping Reference Type:** Optional. When this field is not populated, the reference or link created for the golden record will be of the same type as the source object's reference / link. Click the ellipsis button (...) to specify a reference / link type mapped to this reference / link type.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Reference: Multi Context Trusted Source

This rule can be used for Link strategies only and considers data that is dimension dependent. Analysis is performed for all contexts / qualifiers (a set of one or more dimension points, like country and language) in STEP. The available parameters determine which reference / link is promoted to the golden record.

- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.
- **Reference Type:** Required. Click the ellipsis button (...) to specify the valid reference / link type from the source objects you are handling. When this is the only field populated, a reference / link of the same type pointing to the same target will be promoted to the golden record.

- **Golden Record Reference Type:** Optional. If the objects the source objects are pointing to also have golden records, you can configure the new golden record to point to this golden record rather than the source object's original target. Click the ellipsis button (...) to specify the reference type that links the target golden records and target source objects.
- **Mapping Reference Type:** Optional. When this field is not populated, the reference or link created for the golden record will be of the same type as the source object's reference / link. Click the ellipsis button (...) to specify a reference / link type mapped to this reference / link type.
- **Promote single source only:** When checked, content from the most trusted source is used for all contexts / qualifiers, which prevents empty values in the golden record as long as one of the trusted sources has content. For example, when only the French language, France country context has a value, that value would be written into other contexts that are blank. When not checked, each context / qualifier supplies its own content, including empty values when found.
- **Accumulative promotions:** When checked, all multi-valued references / links and their metadata from multiple source records are written to the golden record. When not checked, only all multi-valued references / links and their metadata from the most trusted source records are written to the golden record. This option should not be used when a single-valued reference / link type is selected.

  Note: If both the 'Accumulative promotions' and the 'Promote single source only' options are checked, then 'Promote single source only' takes precedence, and only references / links from that source are promoted.

- **Prefer dimension point specific references:** When checked, only local references / links are promoted. When not checked, available inherited content is promoted if a local reference / link does not exit. This option can be used in conjunction with the 'Accumulative promotions' option, in order to determine which reference / link to promote when multiple source records have references / links to the same target object.

  Note: If both the 'Prefer dimension point specific references' and the 'Promote single source only' options are checked, then 'Promote single source only' takes precedence, and only references from that source are promoted.

- **Promote inherited references:** When checked, inherited references / links are written to the golden record only if the golden record object type is valid for the selected reference type. When not checked, only local references are written to the golden record.
- **Promote reference suppressions:** When checked, suppressed references / links are written to the golden record. When not checked, suppressed references / links are ignored.

Reference: Trusted Source

This rule can be used for Merge or Link strategies and includes the same options available as the 'Reference: Most Recent' rule, with the addition of a list of trusted sources. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with

data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.

- **Reference Type:** Required. Click the ellipsis button (...) to specify the valid reference / link type from the source objects you are handling. When this is the only field populated, a reference / link of the same type pointing to the same target will be promoted to the golden record.
- **Golden Record Reference Type:** Optional. If the objects the source objects are pointing to also have golden records, you can configure the new golden record to point to this golden record rather than the source object's original target. Click the ellipsis button (...) to specify the reference type that links the target golden records and target source objects.
- **Mapping Reference Type:** Optional. When this field is not populated, the reference or link created for the golden record will be of the same type as the source object's reference / link. Click the ellipsis button (...) to specify a reference / link type mapped to this reference / link type.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Value Rules

The following rules are available for promoting values to a golden record.

Value Default: Most Recent

This rule can be used for Merge or Link strategies and determines that the value is taken from the source with the most recent date for **all** attributes. No attribute or attribute group selection is required for this rule. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Value Default: Trusted Source

This rule can be used for Merge or Link strategies and determines that the value is taken from the most trusted source for **all** attributes. No attribute or attribute troup selection is required for this rule. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Value: Most Recent

This rule can be used for Merge or Link strategies and it specifies that value should be taken from the source object with the most recent value. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Attribute / Attribute Group:** Click the ellipsis button (...) and select a single attribute or all attributes in a specific group for which the rule applies.
- **Group with the latest value change always survives**: If this option is selected, then all values of an attribute group will survive when the group contains the attribute with the most recent timestamp among all compared attribute groups.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Value: Multi Context Trusted Source

This rule can only be used for Link strategies and considers data that is dimension dependent. Analysis is performed for all contexts / qualifiers (a set of one or more dimension points, like country and language) in STEP. The available parameters determine which value is promoted to the golden record.

- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.
- **Attribute / Attribute Group:** Click the ellipsis button (...) and select a single attribute or all attributes in a specific group for which the rule applies.
- **Promote single source only:** When checked, content from the most trusted source is used for all contexts / qualifiers, which prevents empty values in the golden record as long as one of the trusted sources has content. For example, when only the French language, France country context has a value, that value would be written

into other contexts that are blank. When not checked, each context / qualifier supplies its own content, including empty values when found.

- **Prefer dimension point specific values:** When checked, only local values are promoted for the selected attribute / attribute group. When not checked, available inherited content is promoted if a local value does not exit for the selected attribute / attribute group.

  Note: If both the 'Prefer dimension point specific values' and the 'Promote single source only' options are checked, then 'Promote single source only' takes precedence, and only values from that source are promoted for the selected attribute / attribute group.

- **Promote inherited values:** When checked, inherited values are written to the golden record for the selected attribute / attribute group only if the golden record object type is valid. When not checked, only local values are written to the golden record for the selected attribute / attribute group.

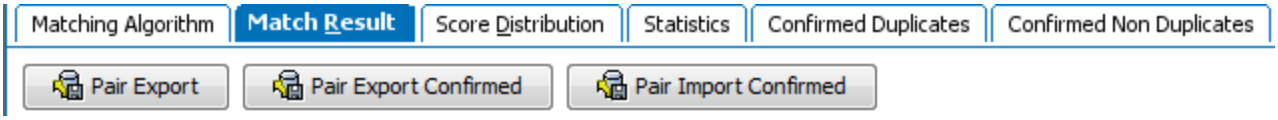
Value: Trusted Source

This rule can be used for Merge or Link strategies and determines that the value is taken from the most trusted source. Analysis is performed in the single context / workspace selected in the algorithm, and that data is promoted across all contexts / qualifiers.

- **Comma separated list of trusted sources:** Enter a comma-separated list of all trusted sources, starting with the most trusted source, then the next-most, and so on. Content is taken from the first trusted source with data. If content does not exist for any of the trusted sources, nothing will be promoted to the golden record.
- **Attribute / Attribute Group:** Click the ellipsis button (...) and select a single attribute or all attributes in a specific group for which the rule applies.
- **Last Edit Date Attribute:** When no attribute is selected, the most recent date is the STEP object revision timestamp when the given element of the survivorship rule entered STEP. Optionally, click the ellipsis button (...) and select the attribute that holds the value to be used as the last edit date when determining the most recent source record to promote to the golden record. The timestamp is taken from the object when the selected attribute is valid for this object. When the selected attribute is not valid for the object, the value is taken from the given element of the survivorship rule, for example, a data container object or a reference object.

Adjusting a Matching Algorithm

When a matching algorithm has first been applied, the identified matches are displayed on the 'Match Result' tab of the matching algorithm. Three options related to fine-tuning the matching algorithm are available: 'Pair Export', 'Pair Import Confirmed', and 'Pair Export Confirmed'.



In order to determine how well different versions of a matching algorithm work, you will need a set of confirmed duplicates and confirmed non-duplicates that can function as a truth table that the algorithms can be tested against. That is, pairs where human users have inspected the data, and for each pair, determined whether they are duplicates or not. This truth table can be built directly from the 'Match Result' tab by confirming or rejecting matched pairs.

Alternately, the 'Pair Export' and 'Pair Import Confirmed' options can be used.

Note: The tools detailed below are not applicable to Match and Merge solutions. Instead, such solutions should make use of the Match Tuning functionality in order to adjust matching algorithms. For more information, see the **Match Tuning** documentation.

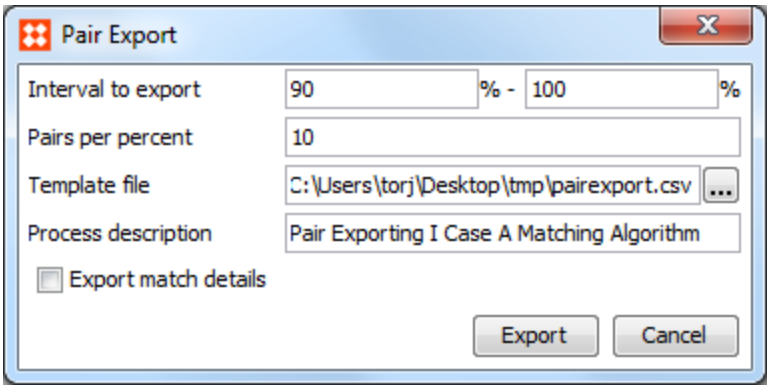
Pair Export

With the 'Pair Export' option, a CSV file is produced that can be used for manual, offline confirmation / rejection of matched pairs. The file has a header and the following standard columns:

- **<Pair>** - One row per source object and the 'Pair' info is used to indicate which objects belong together. The first two rows will have the value '1', the next two rows will have '2', and so on.
- **<Match y n>** - Column used to indicate whether pairs are matches or not. A value is only required for the first object in a pair.
- **<Equality>** - The calculated equality between the two objects.
- **<ID>** - ID of the object in the current row.
- **<Name>** - Name of the object in the current row.
- **<URL>** - STEP URL of the object in the current row.

Note: No template is required for the initial export. The export itself will create a CSV file with the above details.

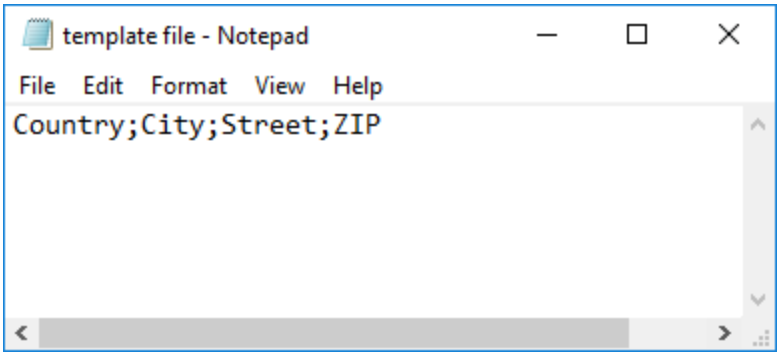
Additionally, for people to work with the data offline, attribute values should be included in the file. For this purpose, a template file with a semicolon-separated list of attribute IDs must be prepared in advance and selected in the 'Pair Export' dialog as shown below.



In the Pair Export dialog, specify the following:

- **Interval to export:** Specify an interval that includes pairs expected to be both matches and non-matches, as well as pairs that are not clear matches or non-matches. Only pairs with scores within this interval are exported.
- **Pairs per percent:** Specify the maximum number of pairs to be exported for each percentage point.
- **Template file:** Select the file (created beforehand) that contains the required attribute values. The format of the file is the attribute IDs separated by semicolons (;).

  This file should be a basic text document such as the one pictured below:



- **Process description:** Provide a description for the background process found under the **Background Process** tab.
- **Export Match Details:** Check this parameter to include columns with part scores from decision table comparators and sub decision tables.

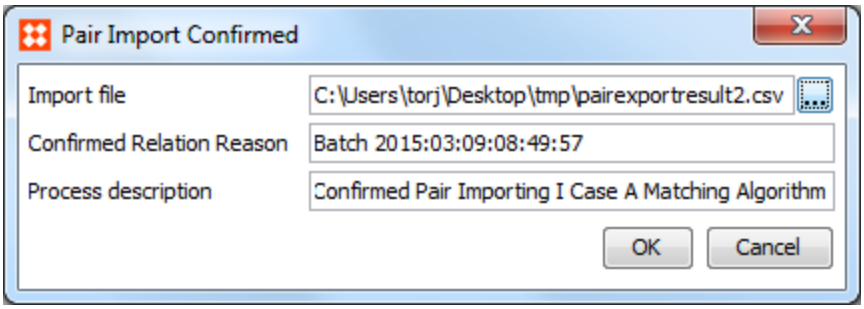
The exported file can be opened in Excel and the decisions can be entered in the <Match y n> column, as shown below:

	A	B	C	D	E	F	G	H
1	<Pair>	<Match y n>	<Equality>	<ID>	<Name>	<URL>	OEM	OEMPartNumber
2	1	y	100	I-EI00042	I EI00042	step://product?id=I-EI00042	Weller	d421881
3	1		100	I-EI00055	I EI00055	step://product?id=I-EI00055	WELLER INC.	d4-21881
4	2	n	100	I-EI00042	I EI00042	step://product?id=I-EI00042	Weller	d421881
5	2		100	I-EI00142	I EI00142	step://product?id=I-EI00142	Weller	D421881
6	3		100	I-EI00055	I EI00055	step://product?id=I-EI00055	WELLER INC.	d4-21881
7	3		100	I-EI00142	I EI00142	step://product?id=I-EI00142	Weller	D421881
8	4		100	I-EI00058	I EI00058	step://product?id=I-EI00058	OSP Manufacturing	yzo41241
9	4		100	I-EI00134	I EI00134	step://product?id=I-EI00134	OSP Manufacturing	YZO-41241

Pair Import Confirmed

Once the file exported via the pair export option has been populated with matches, it can be imported via the 'Pair Import Confirmed' option.

Rather than use the match column, the 'Pair Import Confirmed' process uses its own columns for identification purposes, but does not import any other data. This way you can avoid reverting values updated elsewhere since the pair export was performed.



In the Pair Import Confirmed dialog, specify the following:

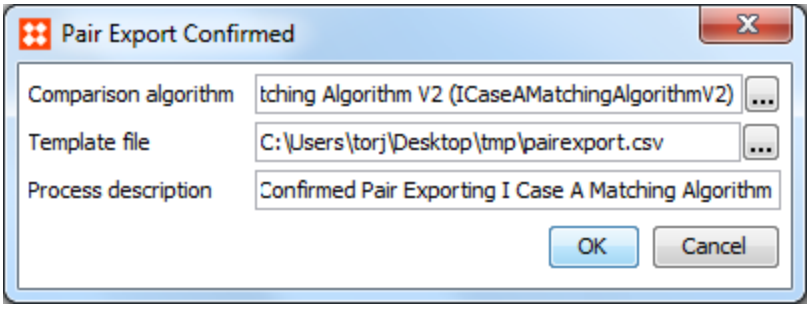
- **Import File:** Select the file that you want to import. This must be a CSV file produced by a pair export process, using a semicolon delimiter. Keep the header line.
- **Confirmed Relation Reason:** Provide a reason for why two objects have been confirmed as duplicates or non-duplicates. This reason is saved on each confirmed relation as a meta data attribute and can be viewed on the matching tab of the relevant objects.
- **Process description:** Provide a description for the background process.

The file import will create 'Confirmed Duplicate' / 'Confirmed Non Duplicate' references between the pair objects.

Pair Export Confirmed

The 'Pair Export' option is used when you want to compare two versions of a matching algorithm against each other and against the confirmed duplicates /non duplicates truth table constructed manually or via the steps described above.

When using this functionality, it is assumed that you have a duplicated and fine-tuned version of your matching algorithm. Along with a template file similar to the one produced for the 'Pair Export' option, the fine-tuned matching algorithm must be selected in the 'Pair Export Confirmed' dialog as shown below.



In the 'Pair Export Confirmed' dialog, specify the following:

- **Comparison Algorithm:** Select the matching algorithm that you want to compare the selected algorithm to.
- **Template File:** Select the file (created beforehand) that contains the required attribute values. The format of the file is the attribute IDs, separated by semicolons (;).
- **Process description:** Provide a description for the background process.

Confirmed Matches Distribution Tool

Once the background process has finished, a CSV file with the comparison results will be produced and the Match Distribution tool is made available. This tool can be used to visualize the differences between the match algorithms and compare their accuracy.

When reviewing the results, you may find false negatives and false positives, which are the errors produced by the algorithm when compared to the manually reviewed pairs. Ideally, the count should be 0, which is the goal of fine-tuning the algorithms. However, even if the count is 0, it does not mean that the algorithm is perfect. The reliability of the result depends on the amount of data in the data set and the representativeness of the data.

If you find that the fine-tuned version of the matching algorithm produces fewer 'False Positives' and 'False Negatives', you can either copy the logic to the original matching algorithm or let the fine-tuned version replace the original one.

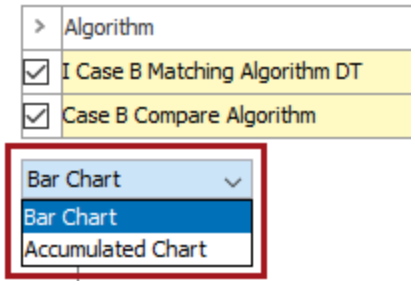
To access the Distribution Tool:

1. On **BG Processes**, expand **Matching Pair Export**, and then select the relevant confirmed export process.
2. At the bottom right corner, click **Show Distribution**. The **Confirmed Matches Distribution** window opens.

3. Select the checkbox to view the algorithm data in the chart.

Algorithm	Threshold	True Negative	False Negative	False Positive	True Positive
I Case B Matching Algorithm DT	70.0	1	0	1	3
Case B Compare Algorithm	70.0	2	2	0	1

4. From the list, select whether to view the data in a bar chart or an accumulated chart.



The table shows the following information about each algorithm:

- **Algorithm:** The ID of the algorithm.
- **Threshold:** The threshold that is used to distinguish between positives and negatives.
- **True Negative:** The number of comparisons that were classified as a non-match, both manually, and by the algorithm.
- **False Negative:** Count of comparisons that were manually classified as a match but were classified as a non-match by the algorithm because the scores were below the threshold.
- **False Positive:** Count of comparisons that were manually classified as a non-match but were classified as a match by the algorithm because the scores were above the threshold.
- **True Positive:** Count of comparisons that were classified as a match both manually and by the algorithm.

The Bar Chart and the Accumulated Chart

The colors used in the charts are unique and identified in the chart legend. Common for both charts, green represents relations that have been manually confirmed as duplicates and red represents relations that have been manually confirmed as non-duplicates.

The threshold of the algorithm is shown as a vertical line.

Generally, the red bars are displayed to the left of the threshold indicator and the green bars to the right. If green bars are displayed to the left of the threshold indicator, they represent false negatives, and if red bars are displayed to the right of the threshold indicator, they represents false positives.

The bars only have a resolution of 1% point. Therefore, you cannot always read the exact number of false positives and false negatives directly from the graph. However, the exact number is listed in the table above it.

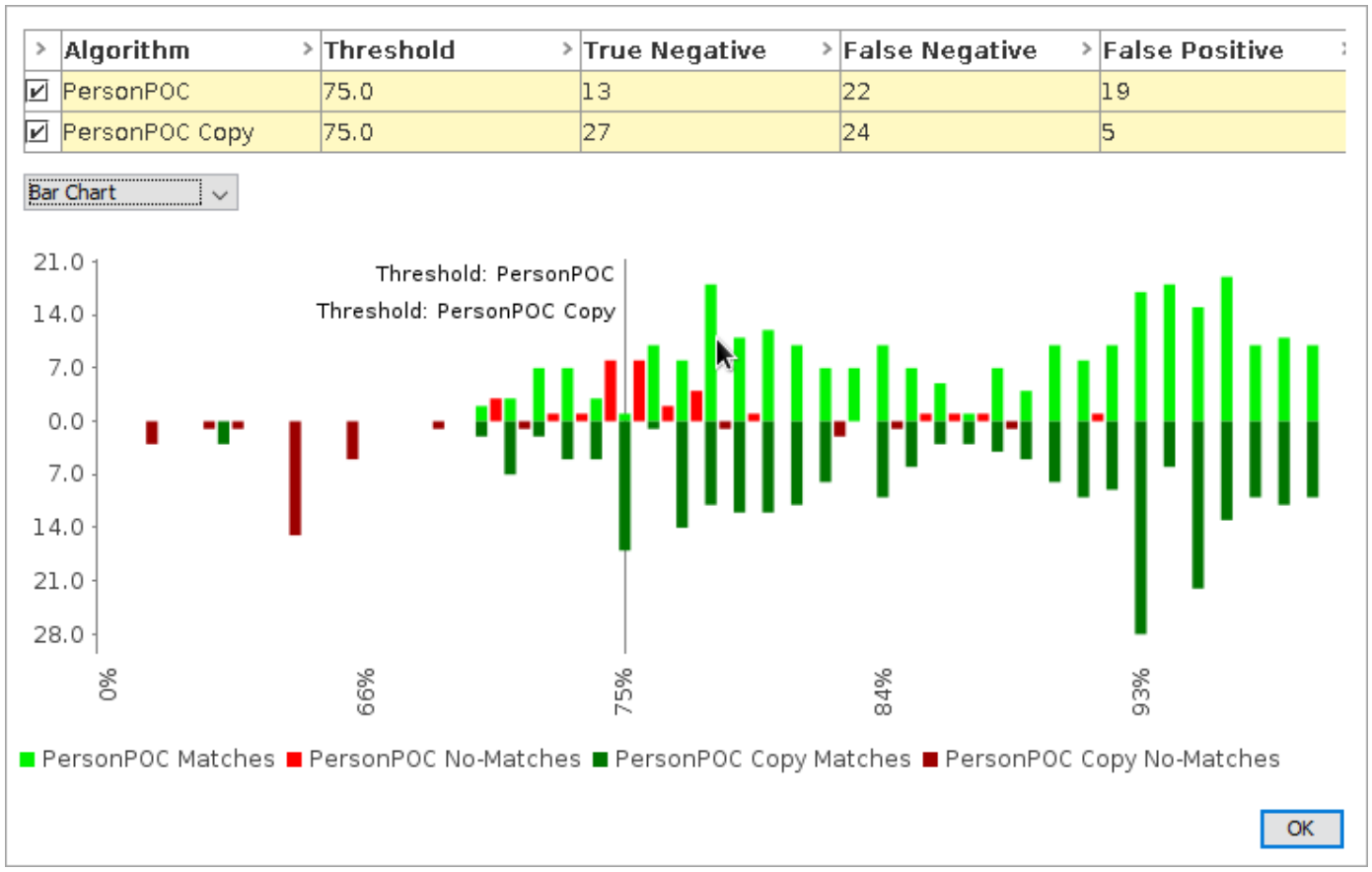
- **The Bar Chart**

The bars in the chart show the frequency of the scores of the selected algorithm. The bar chart can either show a single algorithm or two algorithms in a special compare mode that enables a detailed comparison of the two algorithms.

When clicking a bar, you can view a table that contains an extract of the corresponding data from the CSV file. This enables you to perform a quick inspection of the attribute values of the pairs.

If you need to investigate the algorithm behavior further for a given pair, click the binocular icon . The matching algorithm editor is opened with the relevant pair selected in **System Setup**.

You can then use the Evaluator or open the individual criteria to view more detailed information about the pair.

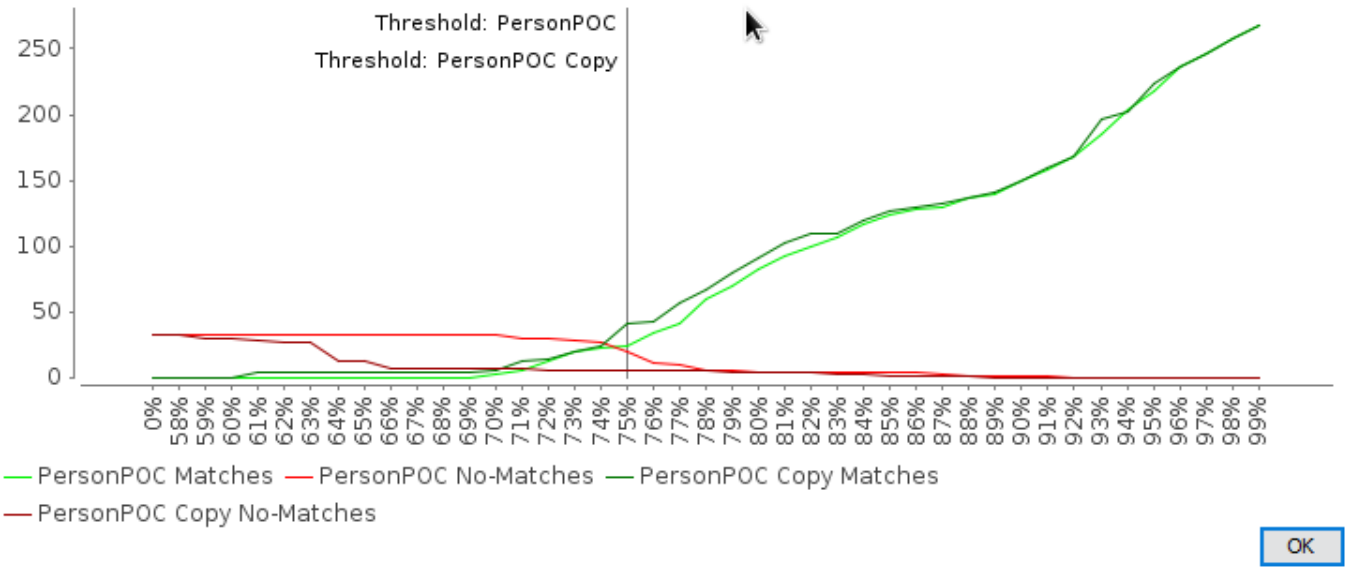


- **The Accumulated Chart**

  The accumulated chart shows the accumulated score frequency for the algorithms. The manually classified matches are green and accumulated to the right of the threshold line. The manually classified no-matches are red and are accumulated to the left. The accumulated chart is useful when you want to compare the matching abilities of two algorithms because it is easy to evaluate the number of scores up to a certain point. The chart is also useful for identifying a good threshold value.

	Algorithm	Threshold	True Negative	False Negative	False Positive
☑	PersonPOC	75.0	13	22	19
☑	PersonPOC Copy	75.0	27	24	5

Accumulated Chart



OK

Configuring Matching Event Processor

The final step in Matching, Linking, and Merging Configuration is to configure a matching event processor. For information on the other required setup steps, see the **Matching, Linking, and Merging Configuration** documentation.

To deduplicate records in STEP, an event processor must be configured to trigger the matching algorithm. When invoked, this event processor creates events for matching, allowing the matching algorithm to match records. Any potential duplicates identified during matching that score between the clerical review threshold and auto threshold are placed into clerical workflow tasks. This allows users to deduplicate records manually.

For more information on the deduplication process, see the **Handling Potential Duplicates** documentation.

Steps for creating an event processor include:

1. Create a matching event processor by following the steps outlined in the **Creating Event Processors** section of the **Event Processors** documentation.

   This section guides you to select the type of processing required (match code generate and update and/or run matching algorithm), the matching algorithm(s) if necessary, establish the schedule, set the queue status, and set the event triggering definitions.

Important: While it is possible to use the same Matching Algorithm across Event Processors, this scenario will usually result in an optimistic locking and/or unique constraint violation when the two processors conflict with one another. Optimistic locking is the implementation where objects are modified concurrently. The result of this is that the system cannot know which value should be represented. To avoid these issues, ensure that each algorithm on the system is run by a single Event Processor.

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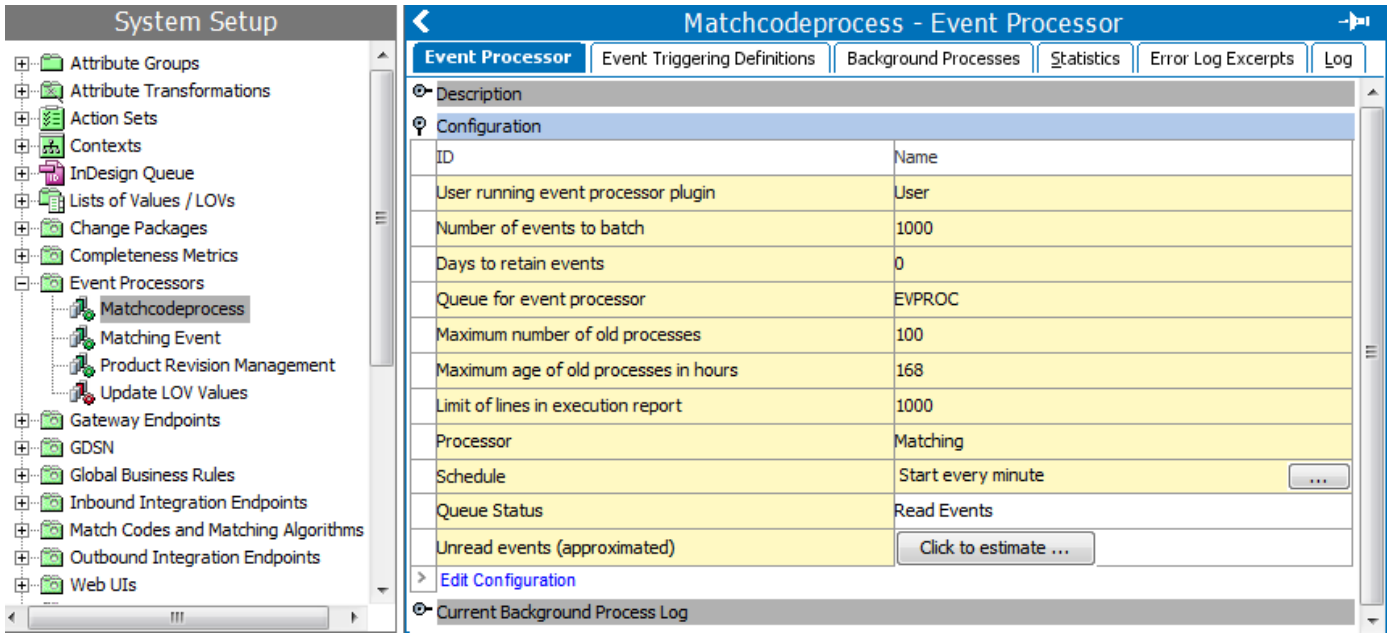
2. Enable the matching event processor by following the steps outlined in the **Enabling Event Processors** section of the **Running an Event Processors** documentation.
3. The matching event processor is ready to run.

Matching Event Processor Example

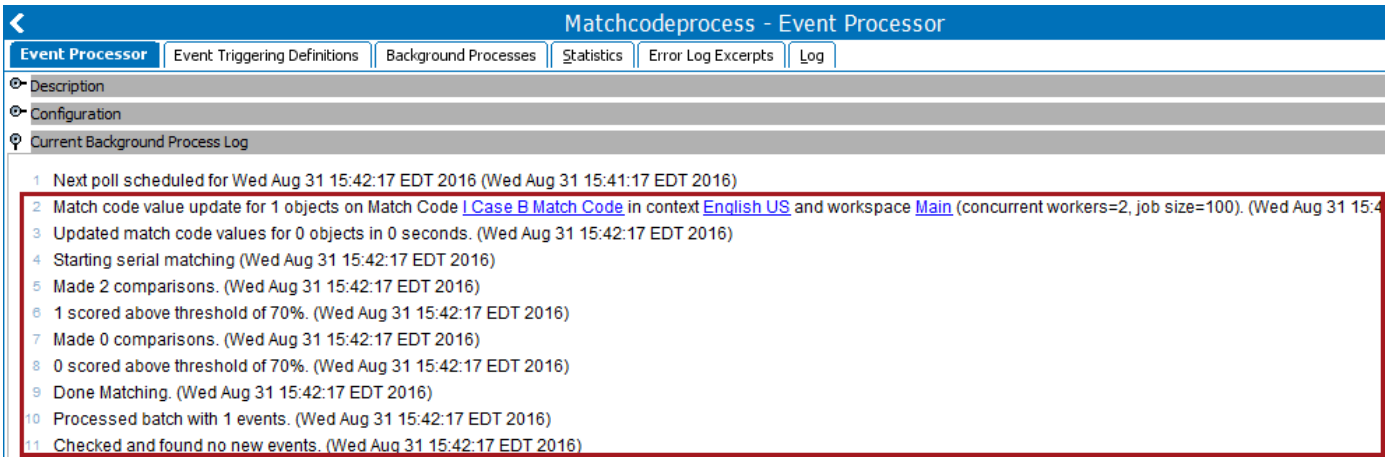
The following example event processor has been configured to:

- Run every minute
- Be triggered by changes on the object types and attributes defined in the match code 'I Case B Match Code'
- Regenerate match codes using 'I Case B Match Code'
- Run the matching algorithm 'I Case B Matching Algorithm DT'

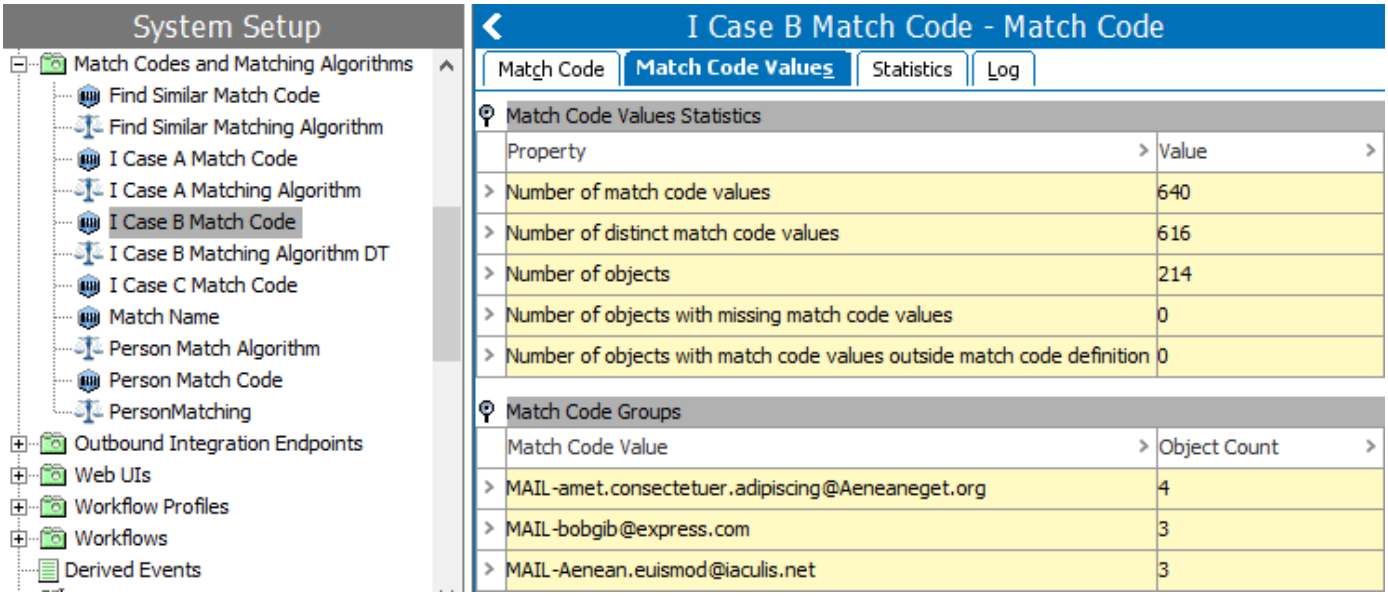


When an entity valid for the match code is updated, the event processor detects the event. On the 'Event Processor' tab, clicking the 'Click to estimate' button reports that an event exists but has not yet been read.

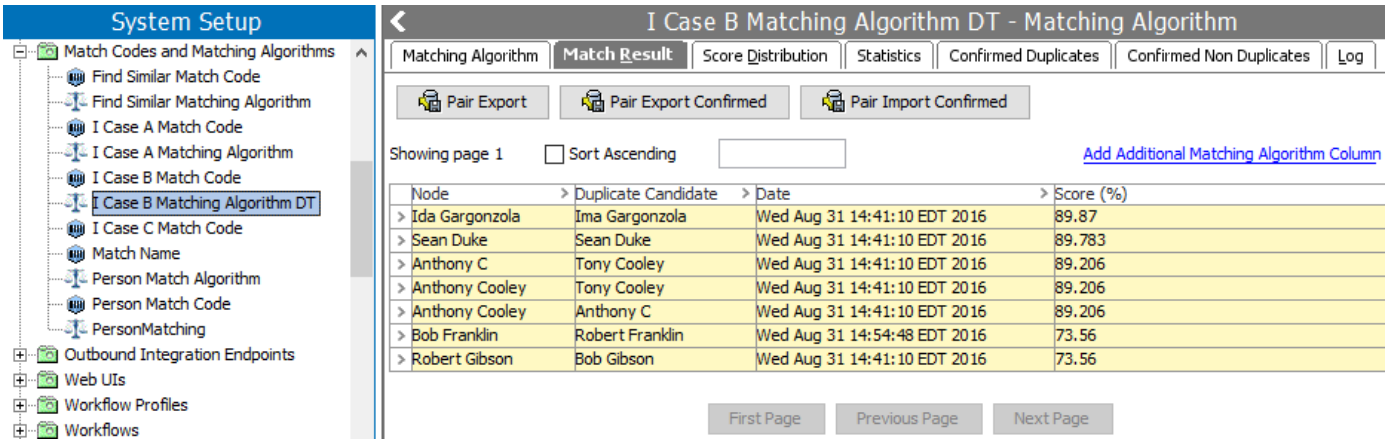
After one minute, the event processor responds to the event, updates the match code values, and then runs the algorithm to determine possible duplicates among the affected object types, based on the defined algorithm threshold.



Once complete, you can view the 'I Case B Match Code' match code. On the Match Code Values tab, open the Match Code Values Statistics flipper, and click the Yes button to calculate the statistics and display information about the existing match codes values.



You can also check which objects scored above the Match Action threshold. These objects are now defined as potential duplicates and are displayed on the 'Match Result' tab of the 'I Case B Matching Algorithm DT'.



For more information, see the **Maintaining an Event Processor** section of the **System Setup / Super User Guide** documentation.

Configuring Golden Records

Before golden records can be generated, several setup tasks must be completed:

- A golden record object type must be created.
- A golden record reference type must be created (if applicable).
- A golden record root node must be created. This is where all golden records are initially populated.
- The golden record object type must be specified in the relevant component models. For more information, see the **Component Model Configuration** documentation.
- The golden record object type, root node, golden record reference type (if applicable), and default source system (if applicable) must all be specified for the match action of the applicable matching algorithm.
- The auto threshold and clerical review threshold must be specified in the match action configuration.
- A clerical review workflow may be configured. For more information, see the **Clerical Review** section of the documentation.

For detailed instructions on configuring golden records for Link Golden Record solutions, see the **Configuring Golden Records for Matching and Linking** documentation.

For detailed instructions on configuring golden records for Merge Golden Record solutions, see the **Configuring Golden Records for Matching and Merging** documentation.

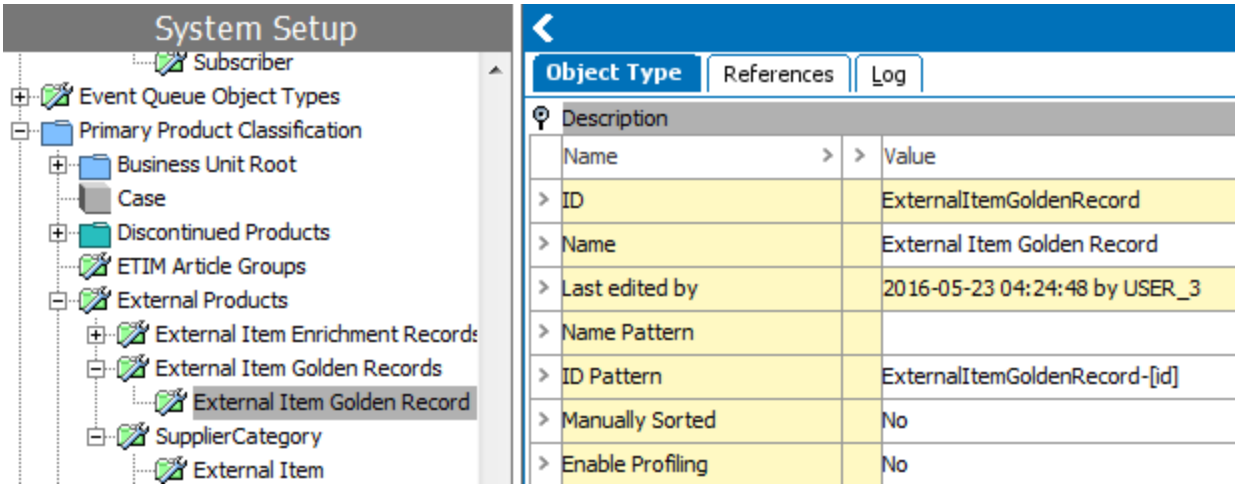
Configuring Golden Records for Matching and Linking

Three steps are required to configure golden records for use in a Matching and Linking solution:

- Create a golden record object type and make the relevant attributes and references valid on it
- Create a golden record reference type
- Configure the match action for the applicable matching algorithm

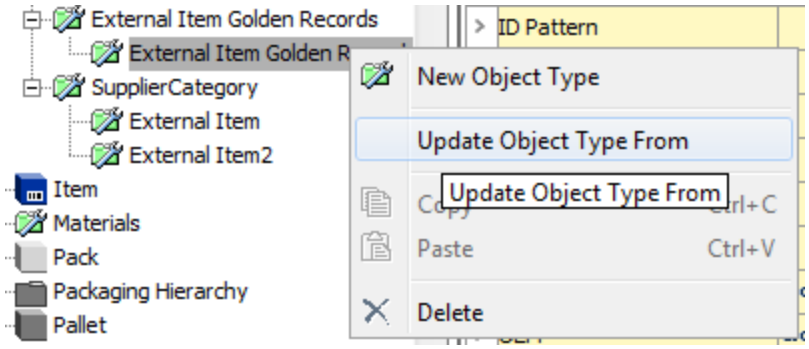
Golden Record Object Type

Golden records cannot share the same object type as their source objects, so it is necessary to create an object type for golden records specifically. Considering how golden records are generated, this object type must have an auto ID pattern configuration.

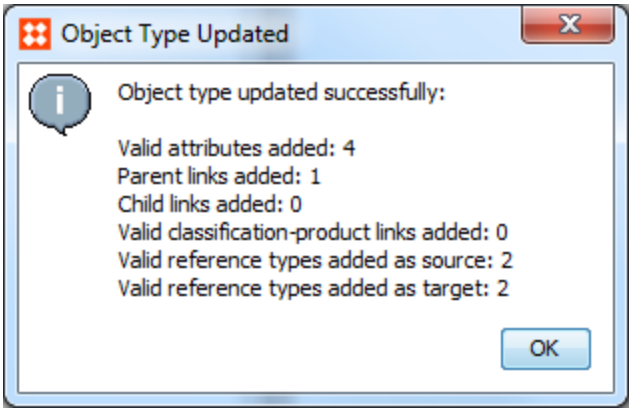


If you intend to copy all data (attribute values and references) from the source objects, the golden record object type should be valid for the same attributes and be a valid source for the same reference / link types. The 'Update Object Type From' operation can be performed to copy this information from the source object:

1. Navigate to the golden record object type node and right-click it.
2. In the dropdown, click 'Update Object Type From'



3. Pick the applicable object type from the selector screen and then click **Select**.



If you choose to copy the information from the source object, some cleanup will be necessary. For example, the golden record object type should not be a legal target for the Duplicate and Non-Duplicate Reference Types. Additionally, the golden record object type should not be valid below the same object types as the source objects.

For more information on creating object types, see the **Object Types and Structures** section of the **System Setup / Super User Guide** documentation.

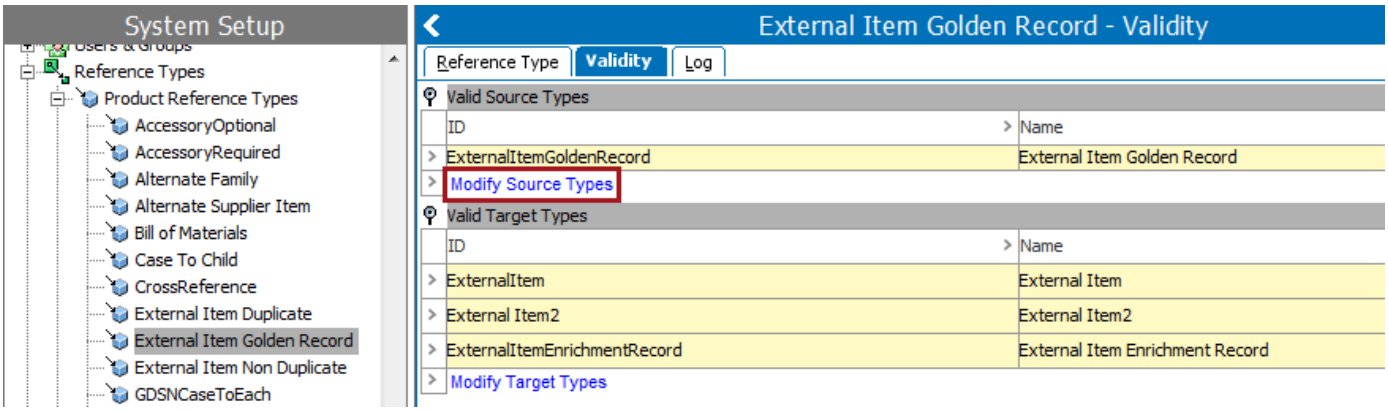
Once created, the golden record object type must be selected in the Matching - Link Golden Record component model.

For more information on the component model configuration, see the **Component Model Configuration** documentation.

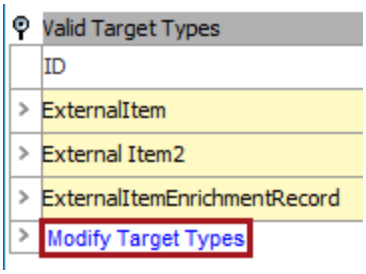
Golden Record Reference Type Validity

In order for golden records to reference back to their source objects, a golden record reference type must be created. The reference type must allow for multiple targets and should be valid from the golden record object type to the source record object type. To configure the validity:

1. On the reference type node, navigate to the 'Validity' tab.
2. In the 'Valid Source Types' area, click the **Modify Source Types** link.



3. In the selector that appears, choose the golden record object type. Then click **OK**.
4. In the 'Valid Target Types' area, click the **Modify Target Types** link.



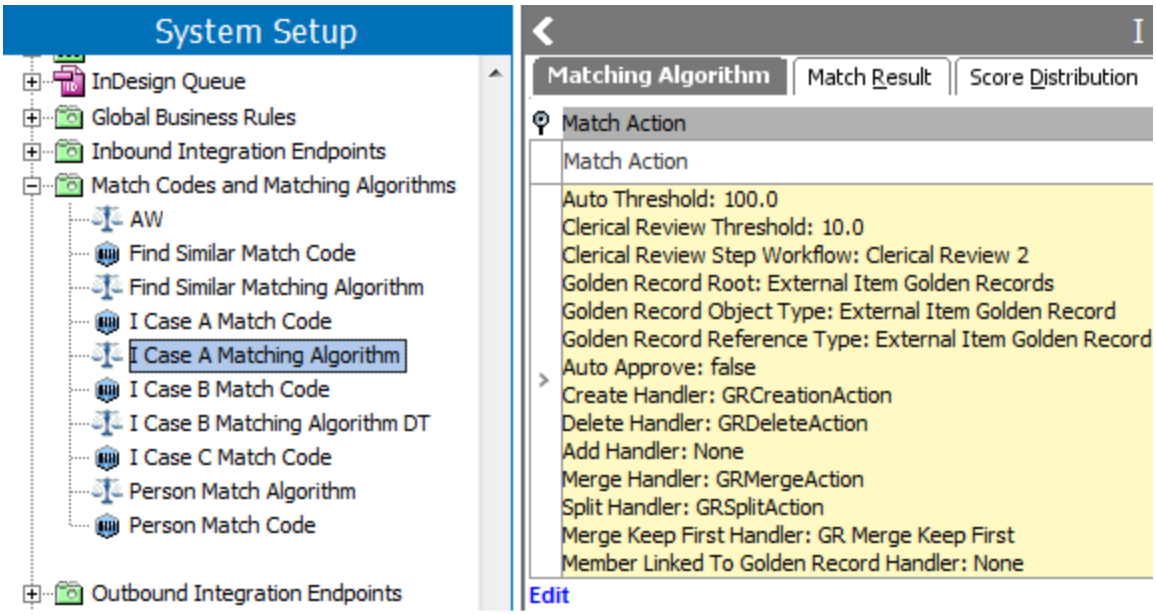
5. In the selector that appears, choose the object types the golden records should reference back to. Then click **OK**.

For more information on creating reference types, see the **Creating a Reference Type** section of the **System Setup / Super User Guide** documentation.

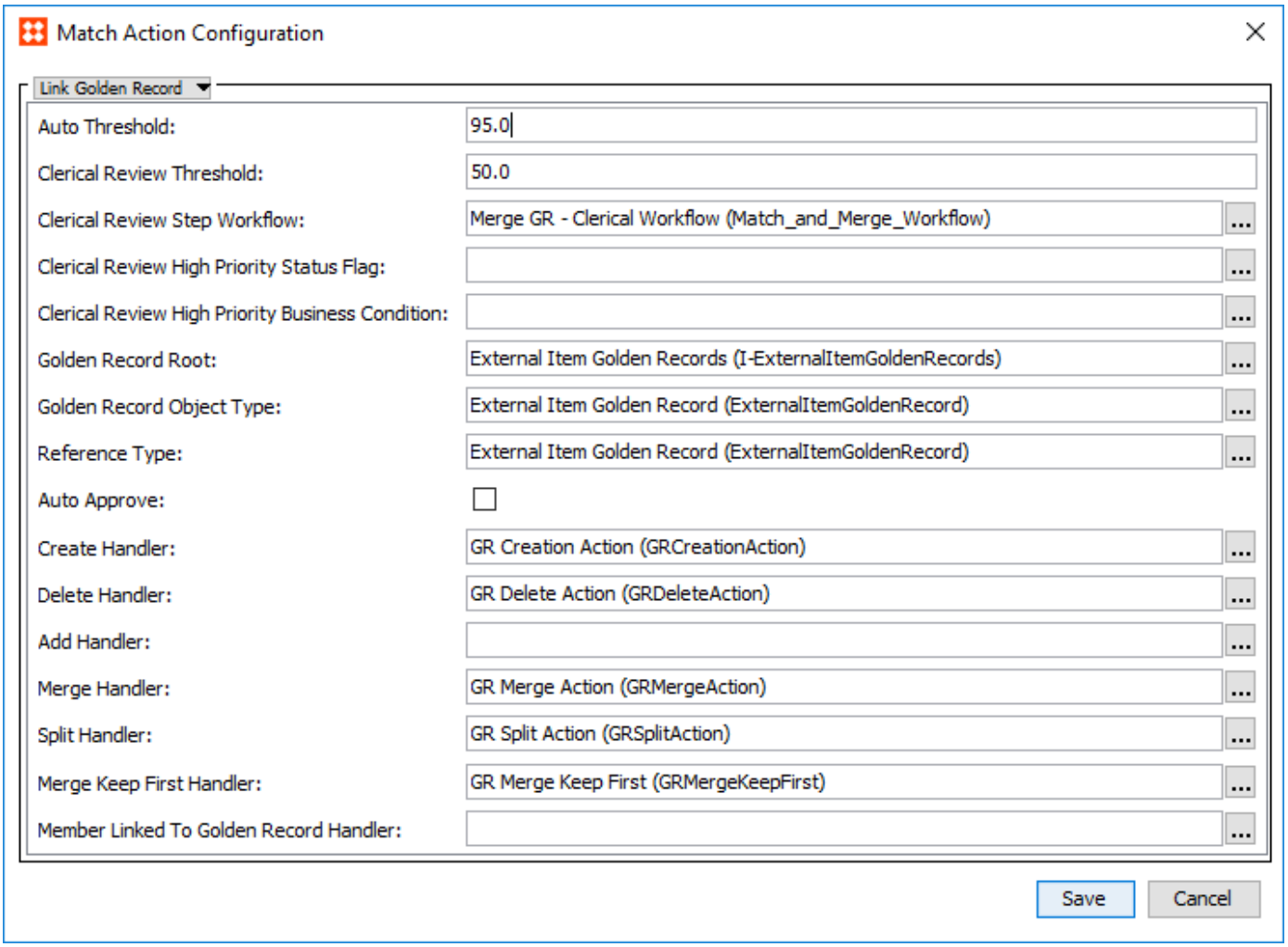
Golden Record Match Action

In order to generate golden records from the desired matching algorithm, the Link Golden Record match action must be configured:

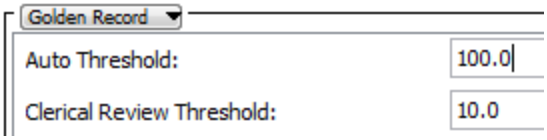
1. On the matching algorithm node, navigate to the 'Matching Algorithm' tab.
2. In the 'Match Action' area, click the **Edit** link.



Once on the 'Match Action Configuration' screen, several parameters must be configured.

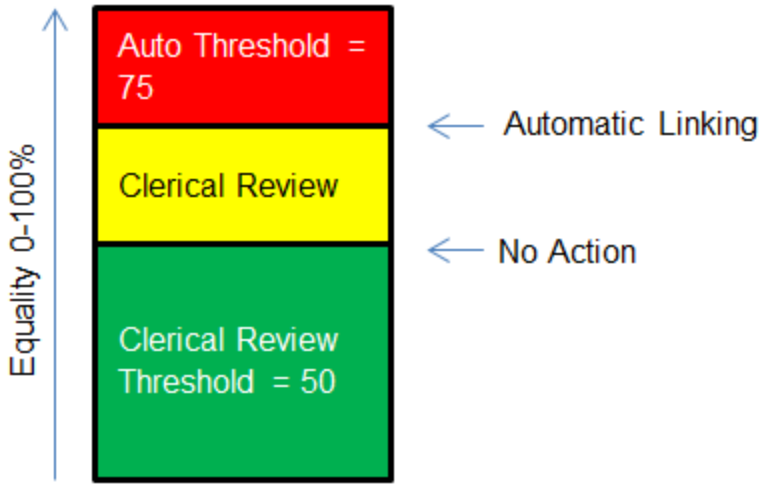


3. For the 'Auto Threshold' and 'Clerical Review Threshold' parameters, specify how matches will be evaluated via an equality measurement.



- The 'Auto Threshold' specifies how equal two source objects have to be in order to automatically have them share the same golden record.
- The 'Clerical Review Threshold' should be equal to or less than the 'Auto Threshold'. It specifies how equal two objects must be to be considered possible duplicates.
- Objects with an equality metric between the 'Clerical Review Threshold' and the 'Auto Threshold' will initially be referenced from separate golden records. If a user then confirms that the objects are in fact duplicates, a

matching algorithm-specific reference will be created between them and they will be made to share the same golden record.



4. In the 'Clerical Review STEP Workflow' parameter, if a clerical review workflow was created, select it.

   For more information, see the **Clerical Review** documentation.

5. In the 'Clerical Review High Priority Status Flag' parameter, click the ellipsis button (...) and select the STEP workflow status flag that is used to designate high priority tasks in the clerical review workflow.
6. In the 'Clerical Review High Priority Business Condition' parameter, click the ellipsis button (...) and select the business condition that is used to verify if a task is of high priority.

Note: If a Status Flag has been configured, but a Business Condition has not, then the status flags behave as if the theoretical Business Condition evaluated to true. If a Business Condition has been configured, and a Status Flag has not, the Business Condition is ignored.

The Business Condition is evaluated on each object in the Clerical Review task (each potential duplicate) in the context of the matcher, and will have access to the Current Object binds.

Note: Though the business condition runs as a part of matching and it involves a clerical review, no Matching or Workflow binds are available.

Important: When Status Flags are used in this way, the Matching Algorithm determines which Status Flags are set (or not set). Due to this, no other Status Flags should be configured in the Clerical Review Workflow.

7. For the 'Golden Record Root', 'Golden Record Object Type', and 'Reference Type' parameters, specify the applicable golden record root node, golden record root object, and golden record reference type respectively.

8. 'Auto Approve' is used to automatically approve the Golden Records being created.

For more information of configuring the match action handlers, see the **Updating Golden Records** documentation.

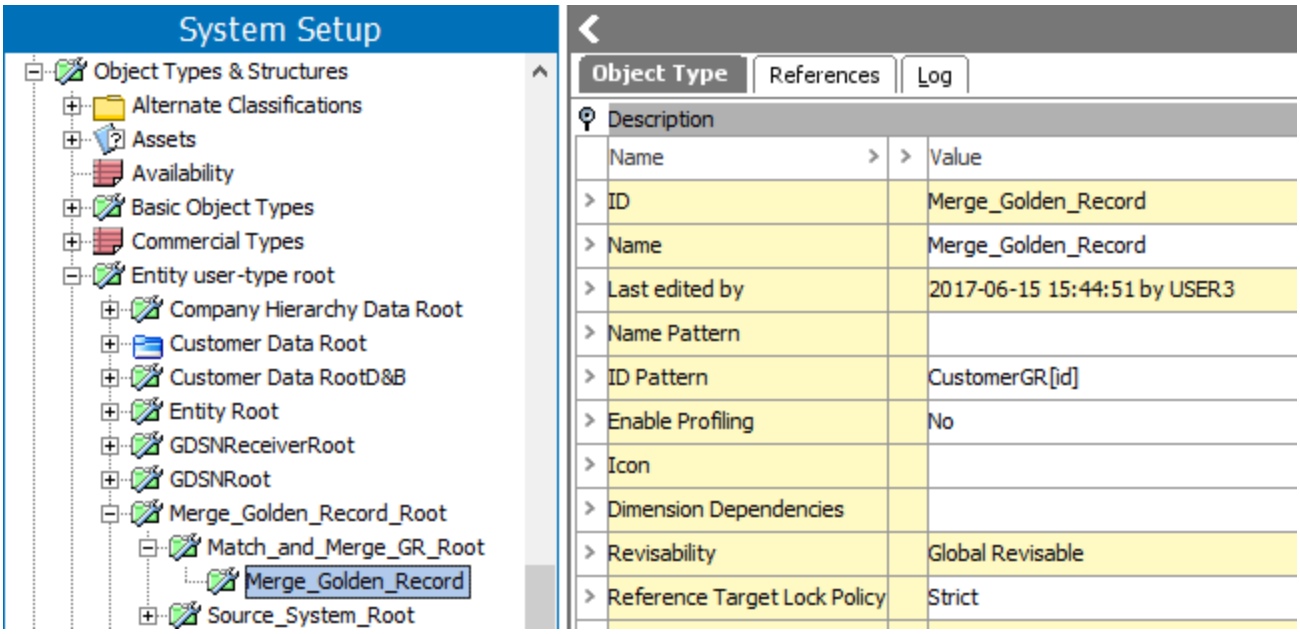
Configuring Golden Records for Matching and Merging

Two steps are required to configure golden records for use in a Matching and Merging solution:

- Create a golden record object type
- Configure the match action for the applicable matching algorithm

Golden Record Object Type

Golden records must be configured before being mapped to the component model and cited in a match action configuration. Considering how golden records are generated, this object type must have an auto ID pattern configuration.



For more information on creating object types, see the **Object Types and Structures** section of the **System Setup / Super User Guide** documentation.

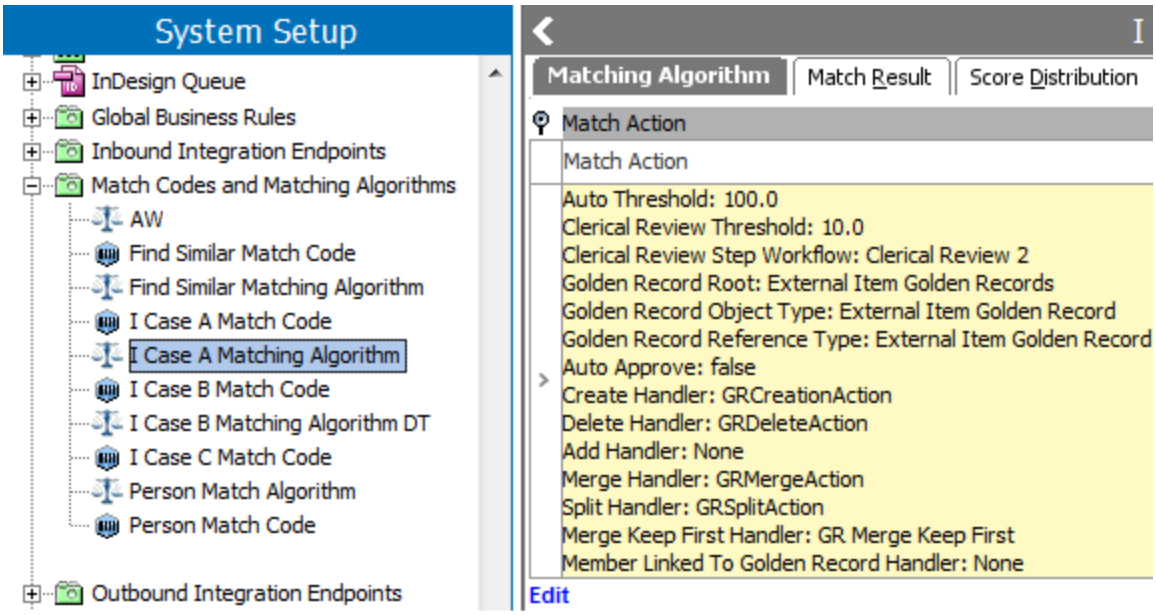
Once created, the golden record object type must be selected in the Matching - Merge Golden Record component model.

For more information on the component model configuration, see the **Component Model Configuration** documentation.

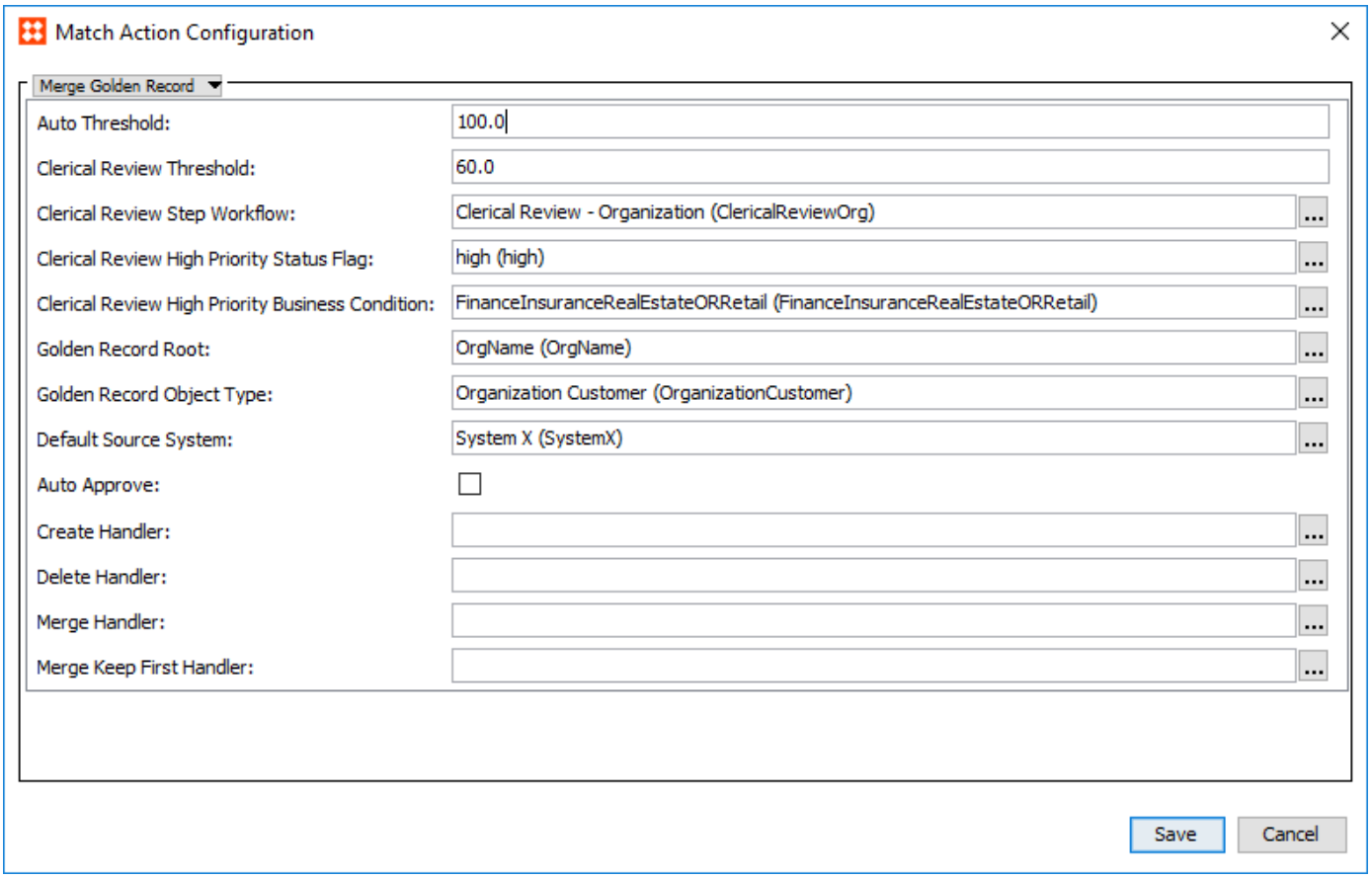
Golden Record Match Action

In order to generate golden records from the desired matching algorithm, the Merge Golden Record match action must be configured:

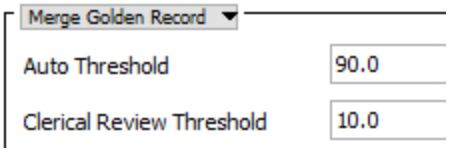
1. On the matching algorithm node, navigate to the 'Matching Algorithm' tab.
2. In the 'Match Action' area, click the **Edit** link.



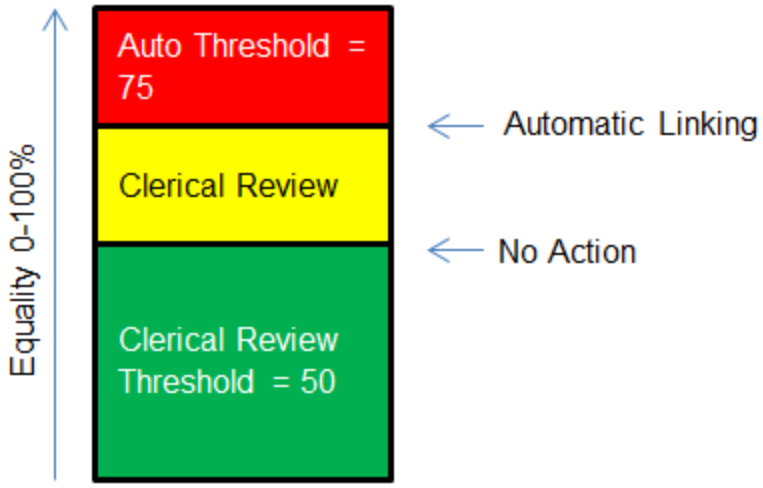
Once on the 'Match Action Configuration' screen, several parameters must be configured.



3. For the 'Auto Threshold' and 'Clerical Review Threshold' parameters, specify how matches will be evaluated via an equality measurement.



- The 'Auto Threshold' specifies how equal two objects have to be in order to automatically have them merged together.
- The 'Clerical Review Threshold' should be equal to or less than the 'Auto Threshold'. It specifies how equal two objects must be to be considered potential duplicates.
- Objects with an equality metric between the 'Clerical Review Threshold' and the 'Auto Threshold' will be flagged as potential duplicates and enter a clerical review workflow together. If a user then confirms that the objects are in fact duplicates, they can be merged together. Records that contribute data but do not survive the merge are deactivated.



4. In the 'Clerical Review STEP Workflow' parameter, click the ellipsis button (...) and select the relevant clerical review workflow.

   For more information, see the **Clerical Review** documentation.

5. In the 'Clerical Review High Priority Status Flag' parameter, click the ellipsis button (...) and select the STEP workflow status flag that is used to designate high priority tasks in the clerical review workflow.
6. In the 'Clerical Review High Priority Business Condition' parameter, click the ellipsis button (...) and select the business condition that is used to verify if a task is of high priority.

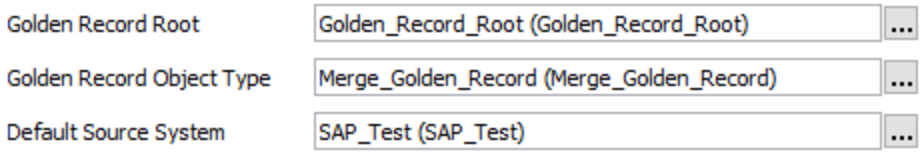
   Note: If a Status Flag has been configured, but a Business Condition has not, then the status flags behave as if the theoretical Business Condition evaluated to true. If a Business Condition has been configured, and a Status Flag has not, the Business Condition is ignored.

   The Business Condition is evaluated on each object in the Clerical Review task (each potential duplicate) in the context of the matcher, and will have access to the Current Object binds.

   Note: Though the business condition runs as a part of matching and it involves a clerical review, no Matching or Workflow binds are available.

   Important: When Status Flags are used in this way, the Matching Algorithm determines which Status Flags are set (or not set). Due to this, no other Status Flags should be configured in the Clerical Review Workflow.

7. For the 'Golden Record Root', 'Golden Record Object Type', and 'Default Source System' parameters, specify the applicable golden record root node, golden record root object, and default source system respectively.



8. In the 'Default Source System' parameter, click the ellipsis button (...) and select the source system that should be used if no source system information is available upon import / merging of records.
9. 'Auto Approve' is used to automatically approve the Golden Records being created.

Note: Match and Merge does support the import of records without source system references.

For more information of configuring the match action handlers, see the **Updating Golden Records** documentation.

Clerical Review

After running a matching algorithm, some paired objects may need to be manually reviewed to determine whether or not they are actual duplicates. An object is flagged for clerical review if its equality metric falls between the 'Clerical Review Threshold' and the 'Auto Threshold', as defined by the algorithm's golden record match action. It is subsequently placed into a workflow for review by an end user.

When configured for clerical review, a workflow allows users to easily review and confirm or reject potential duplicate objects.

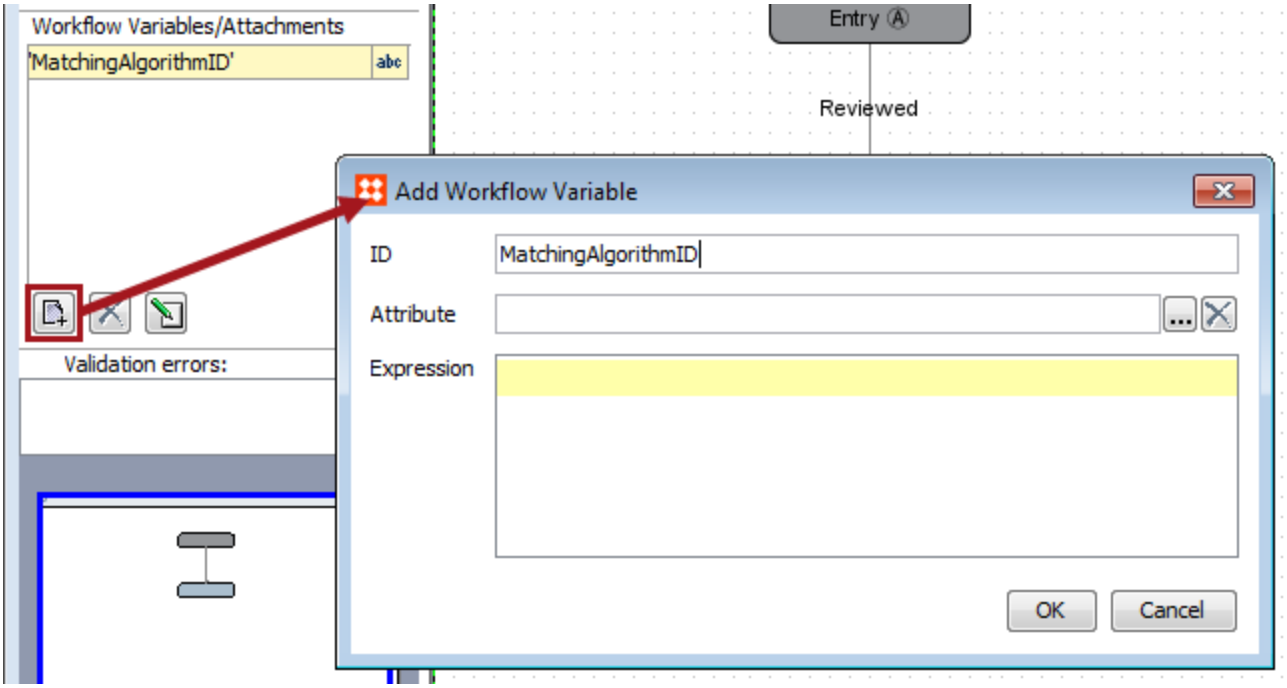
For more information about the golden record match action, see the **Configuring Golden Records** documentation.

Note: Items in a Clerical Review workflow are typically handled by data stewards.

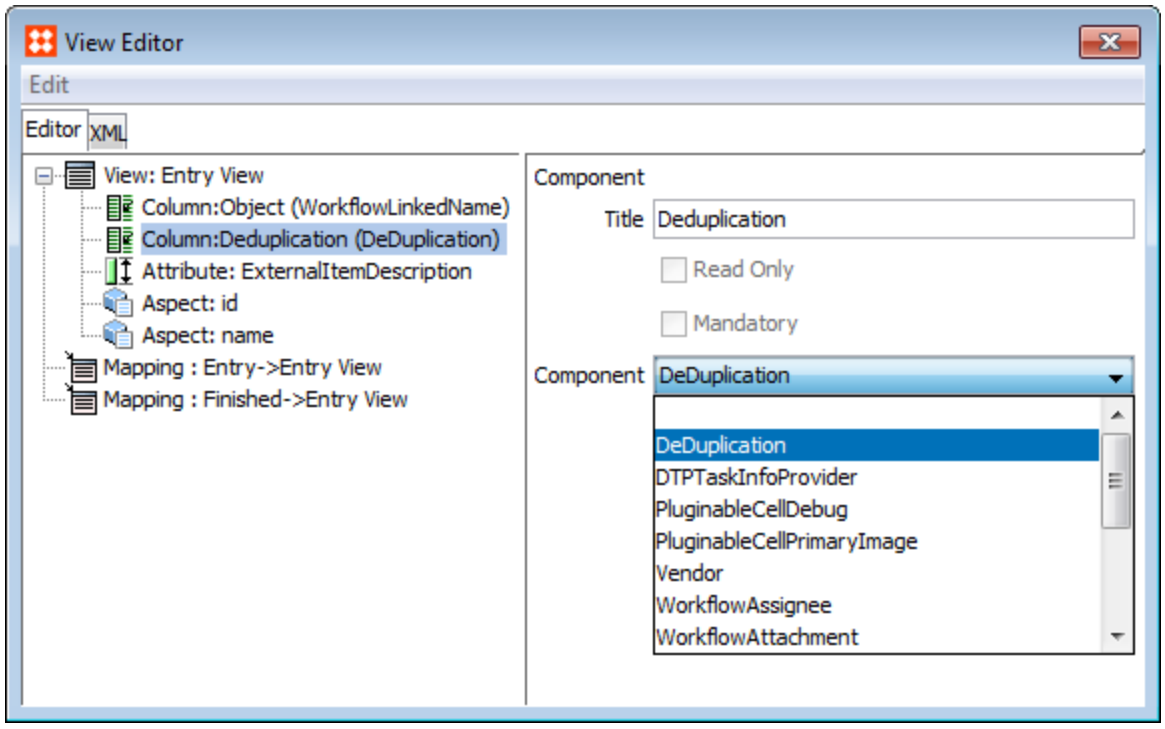
Configuring a Workflow for Clerical Review

To configure a workflow that can handle clerical review, the following steps need to be followed:

1. Create the workflow that will handle the clerical review. See **Creating a Workflow** in the **Workflows** documentation for more information.
2. Once configured, in the 'Workflow Variables / Attachments ' area of the workflow editor, click the 'Add' icon and select 'Add a Workflow Variable'. In the 'ID' field, enter 'MatchingAlgorithmID', then click **OK**.



3. Under 'Edit' > 'Edit Workbench Views and Mappings', right-click the relevant view in the editor tab and select 'Add Column' > 'Component'. In the 'Component' dropdown selector, select 'DeDuplication'.



4. After saving the workflow, navigate to the relevant matching algorithm. In the 'Match Action' area of the 'Matching Algorithm' tab, click the 'Edit Match Action' link. For the 'Clerical Review Step Workflow' parameter, click the ellipsis button (...) and choose the workflow you configured from the selector. Click **Save** to save changes to the algorithm.

5. The next time the relevant match codes are generated and the matching algorithm is run, objects that fall between the 'Clerical Review Threshold' and the 'Auto Threshold' will be initiated into the workflow.

Working with Items in the Workflow via Workbench

To view any items placed into the workflow configured for clerical review, navigate to the **STEP Workflow** tab and expand the flipper for the appropriate workflow.

Note: Only one record is actually submitted into the workflow when a match is found. A reference is created that links the matched records to the one entered in the workflow and they all appear together within the workflow task. From the perspective of the data steward, this nuance is typically unimportant.

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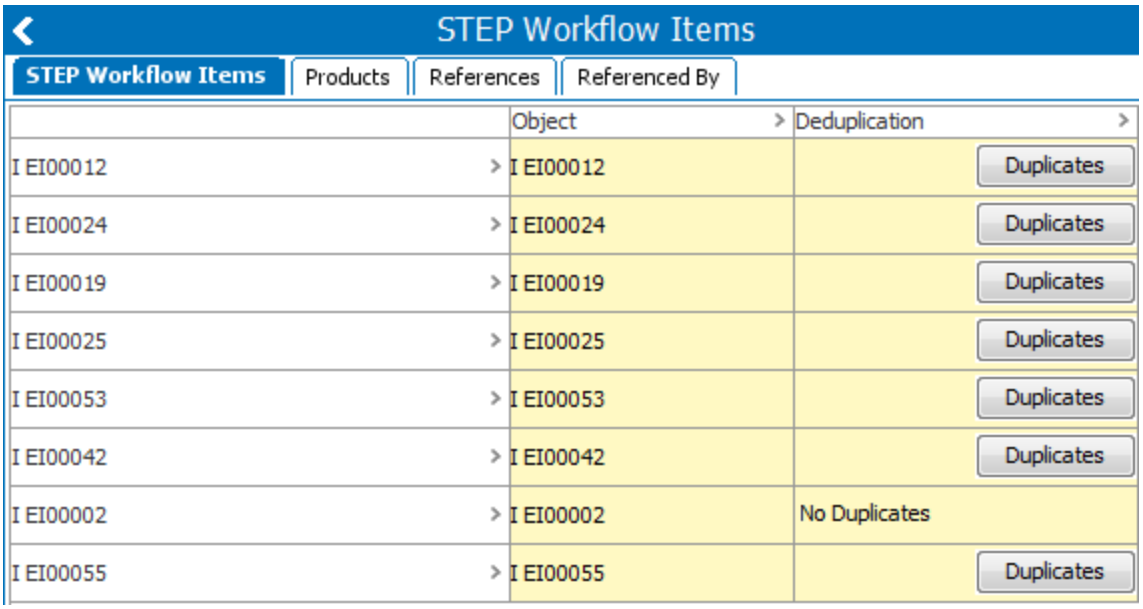
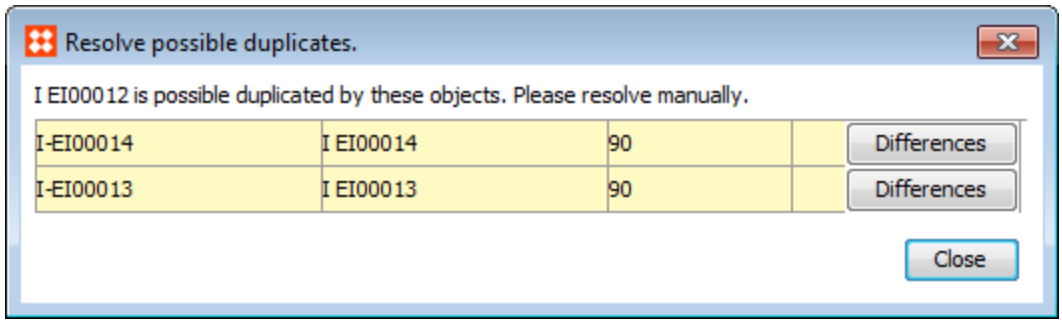
1. Select the desired state to see which objects require a clerical review.



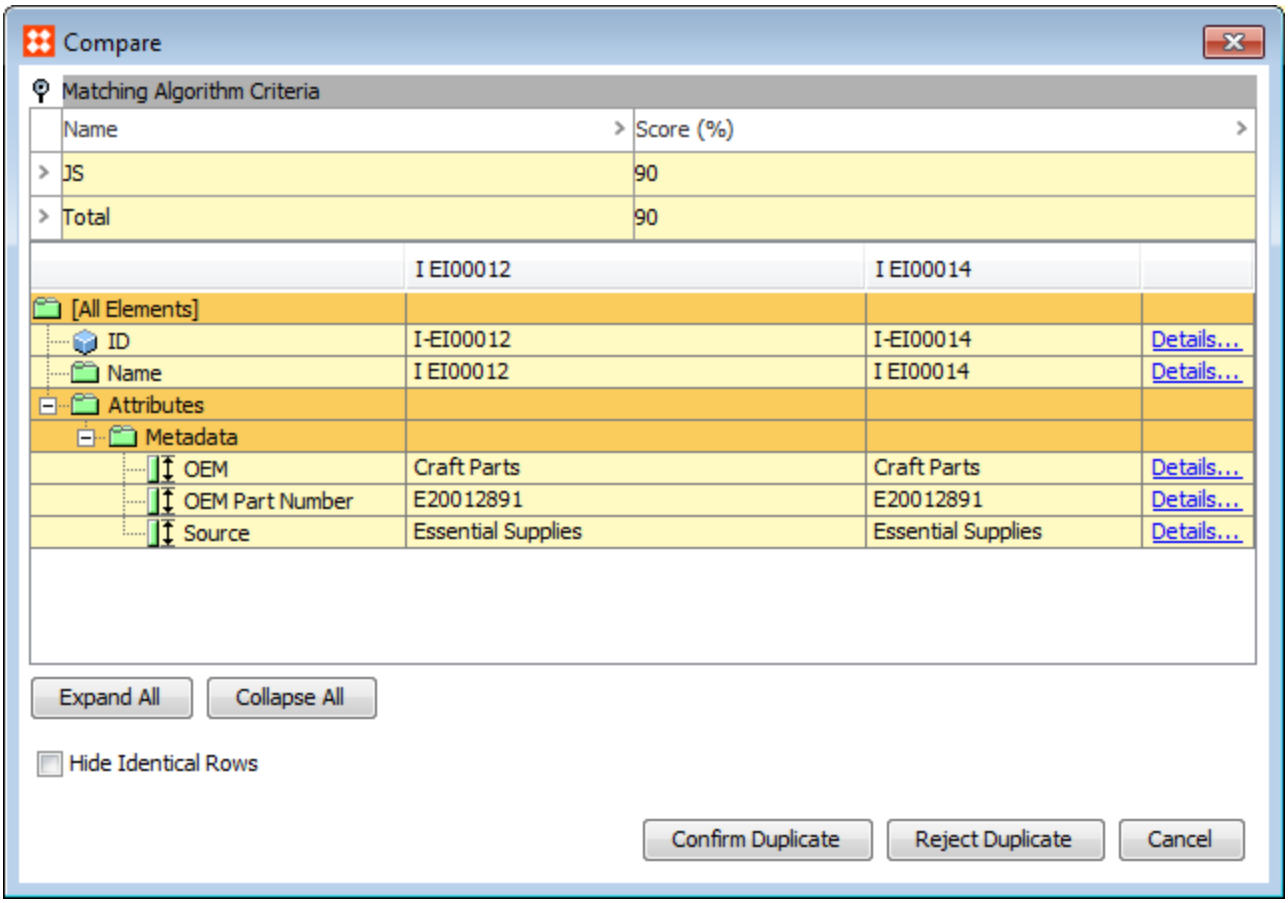
2. To review an object, click the **Duplicates** button. A window will appear that lists all potential duplicates for the selected object and the equality metric for each pair.

Note: This can also be accessed via the 'Tasks' tab of the relevant object in **Tree**.



3. To compare the selected object with one of its potential duplicates, click the **Differences** button. A window will appear comparing the attributes of each object. The user can confirm or reject that they are duplicates via the **Confirm Duplicate** and **Reject Duplicate** buttons.

Note: It is not recommended to perform any workbench clerical review actions on matches generated through a Merge Golden Record match action. Instead, these clerical review tasks should be handled in Web UI. For more information, see the **Golden Record Clerical Review Task List** section of the **Web User Interfaces** documentation.



Clerical reviews can also be performed via workflows in Web UI. For use in a Merge Golden Record solution specifically, see the **Matching and Merging in Web UI** documentation.

For more information on configuring a deduplication clerical review for Potential Duplicate and Link Golden Record solutions, see the **Configuring a Deduplication Clerical Review** documentation.

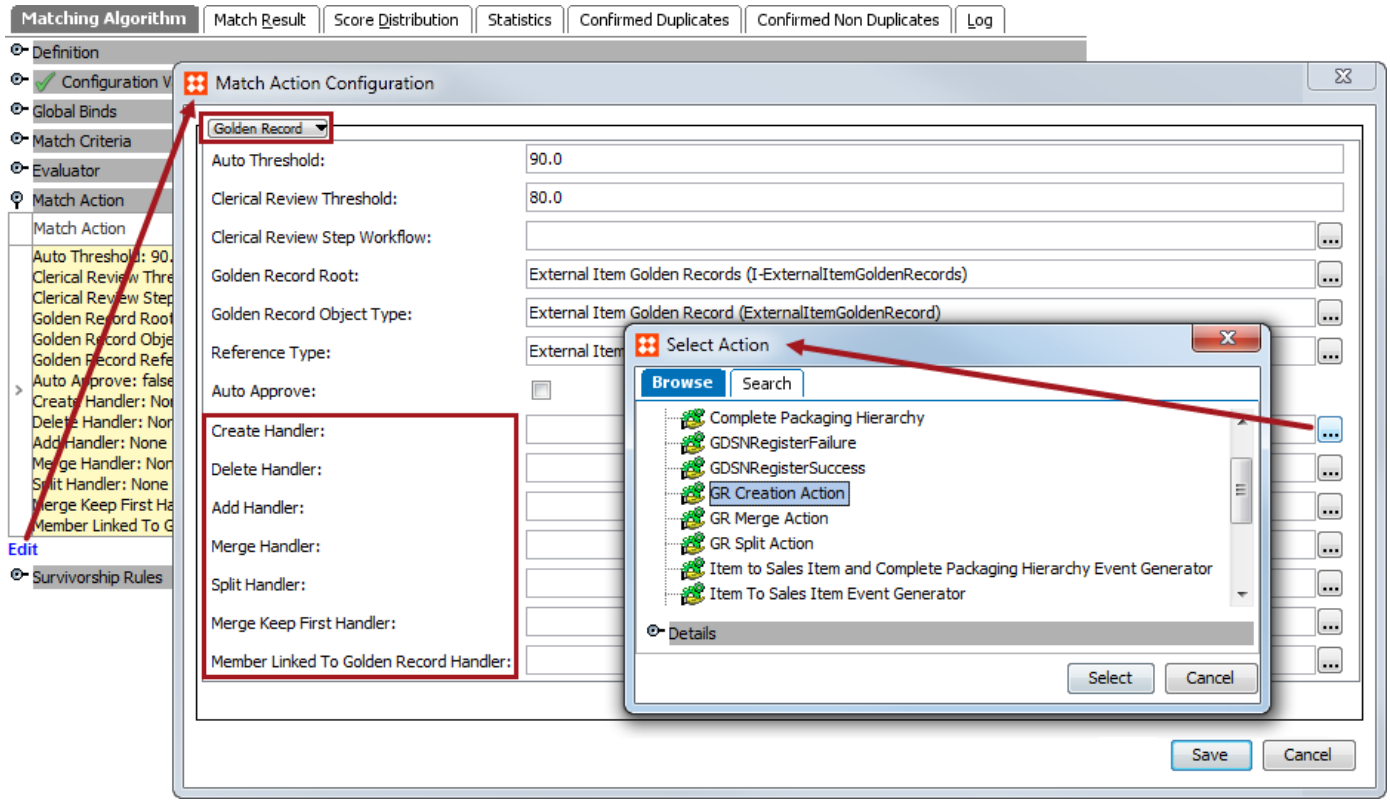
Updating Golden Records

Working with a golden record setup often requires specific actions when a golden record is changed (created, deleted, merged, split, etc.). In these cases, the matching algorithm can be configured to call a business rule via a handler in order to allow for more granular processing of events. For example, when two existing golden records are merged, additional actions may need to occur in addition to the survivorship rules.

Golden Record Handlers

Based on the requirement of the handler as defined below, an existing business action or condition can be selected. For more information on creating a new business rule, see the **Business Rules** section of the **Business Rules** documentation.

These handlers can be added to the algorithm via the **Match Action** flipper.



Matching and Linking Solutions

The following handlers are available for the Matching and Linking solution:

- **Create Handler**: The selected business action runs on the golden record after it has been created and has initial source object links, but before survivorship rules run.
- **Delete Handler**: The selected business action runs after the golden record is deleted. For example, when merging two golden records, one is deleted. The delete handler runs after the merge handler, which means that the golden record has no linked source records. Alternatively, in this case, if the delete handler field is blank, then the incoming references of the surviving golden record are re-targeted and re-approved (if they were approved before); the golden record is deleted and, if auto-approve is enabled, the deletion is approved.
- **Add Handler**: The selected business action runs on the golden record after a new source is added, but before any survivorship rules run.
- **Merge Handler**: The selected business action runs when two golden records are merged (because their sources match). The source(s) are moved to the golden record that will be kept and the delete handler is called for the golden record that will be deleted.
- **Split Handler**: The selected business action runs when a golden record is split (because one or more of its sources no longer match). The split handler runs after the new golden record is created and its source record links are updated, but before survivorship rules run. The original and new golden records each reflect the correct source records. The create handler is not called when golden records split.
- **Merge Keep First Handler**: The selected business condition runs when two golden records are being merged and allows identification of the golden record that should be kept. Use the Current Object and Secondary Object binds in the condition and return one of the following options:
  - null = default behavior; keep the golden record with most members, if there is an equal number, keep the oldest golden record
  - true = golden record bound to “Secondary Object” is deleted
  - false = golden record bound to “Current Object” is deleted
- **Member Linked to Golden Record Handler**: The selected business action runs on the source object when a source object link changes from one golden record to a new golden record. The handler runs after the sources have been added, but before survivorship rules run.

Matching and Merging Solutions

The following handlers are available for the Matching and Merging solution:

- **Create Handler**: The selected business action runs on the golden record after it has been created, but before survivorship rules run.

  The supplied golden records are retrieved by the STEP manager with the context and workspace defined by the matching algorithm (or Main workspace if defined as Approved workspace).

  The newly created golden record is bound to the **Current Object** parameter.

- **Delete Handler**: The selected business action runs after the golden record is deleted. This takes place immediately after the Merge Handler.

  If no implementations of this handler exist the default deactivation behavior is to:

1. Remove all confirmed relations (confirmed duplicates and confirmed non-duplicates).
2. Reallocate incoming references to surviving golden record and re-approve these references if they were approved already.
3. Deactivate golden record, copy source information to survivor, and create 'Merged Into' reference to surviving record.
4. Remove match code values.
5. Remove links to potential duplicates.
6. Delete any existing task in clerical review workflow.

If using this handler then the implementation must account for all the above steps in addition to whatever else is required for deletion.

If auto-approve is enabled then the surviving golden record will be approved after the business logic is executed.

The supplied golden records are retrieved by the STEP manager with the context and workspace defined by the matching algorithm (or Main workspace if defined as Approved workspace).

The newly deleted golden record is bound to the **Current Object** parameter.

- **Merge Handler**: The selected business action runs when two golden records are merged. This handler is invoked after the surviving record has been determined and the record to be deactivated has been merged. Immediately after the call to this handler the **Delete Handler** is called to deactivate the relevant golden record.

  The supplied golden records are retrieved by the STEP manager with the context and workspace defined by the matching algorithm (or Main workspace if defined as Approved workspace).

  The surviving golden record is bound to the **Current Object** parameter. The golden record to be deactivated / deleted is bound to the **Secondary Object** parameter.

- **Merge Keep First Handler**: The selected business condition evaluates when two golden records are being merged and allows identification of the golden record that should survive. If this handler is not used the default behavior is to keep the golden record that was created first.

  The supplied golden records are retrieved by the STEP manager with the context and workspace defined by the matching algorithm (or Main workspace if defined as Approved workspace).

  The surviving golden record is bound to the **Current Object** parameter. The golden record to be deactivated / deleted is bound to the **Secondary Object** parameter.

  The business condition should evaluate to 'True' to keep first golden record or evaluate to 'False' to keep the second golden record.

These handlers are completely optional and may not be applicable to all solutions.

For information about writing business rules that require access to two objects (for example, two golden records in merge and split cases), see the JavaScript **Secondary Object Bind** documentation in the **Resource Materials** online help.

Internal Data Source Objects

In Matching and Linking setups there will typically be a need for having objects related to golden records, on which it is possible to maintain data. Such 'enrichment records' or 'Internal Data Source Objects' should be created in accordance with the following rules:

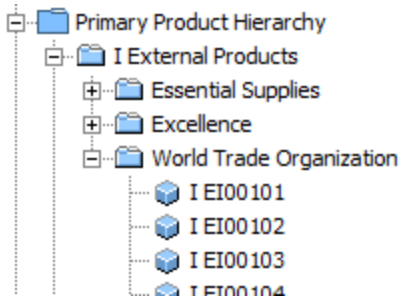
- Use a unique object type that is different from the object types of golden record and other source objects.
- Do not generate match codes for internal data source objects.
- In the Matching Component Model Configuration, Source Object Type aspect, add the Object Type of the internal data source object.
- Golden records should use the same reference types for internal source objects and for other source objects.

Use the following setup to update the golden record when an internal data source object changes:

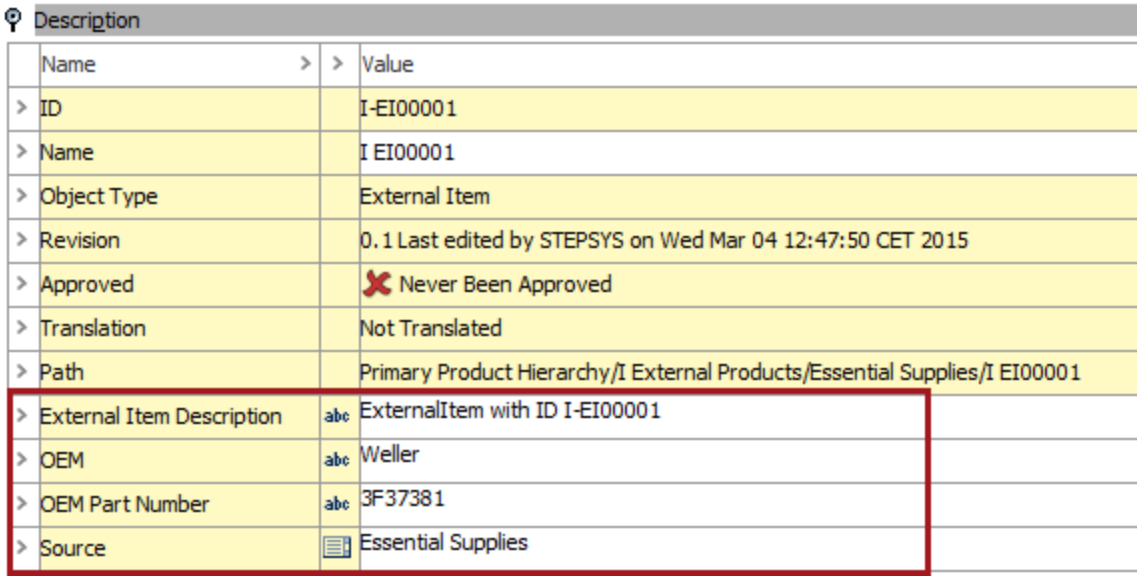
1. Configure the event processor to listen on events for internal data source objects.
2. Create a business action to find the golden record for the internal data source object, identify one of the other source objects for the golden record, and then generate an event for that object for the event processor.
3. Create an event filter condition that is always false since the original event for the internal data source object will not go onto the queue.

Configuration Example - Basic

This example use case concerns deduplication of products from different suppliers. The products are of the object type 'External Item' and live below an 'External Products' product category node, below which they are again organized by supplier.



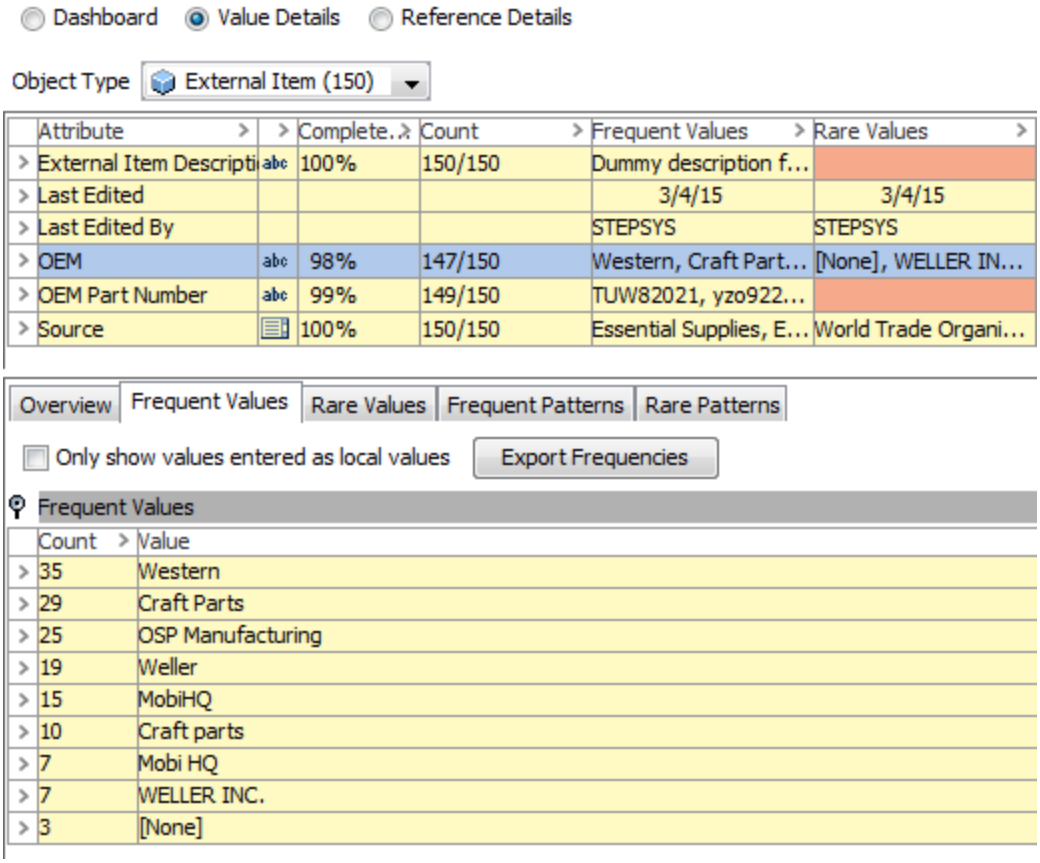
Each External Item has four significant attributes: 'OEM' (Original Equipment Manufacturer), 'OEM Part Number', 'Source' (supplier), and 'External Item Description'. The main objective is to identify duplicates based on the OEM and OEM Part Number attributes, i.e., the items are duplicates if they have the same OEM and OEM Part Number.



Data Profile Analysis

Designing a deduplication strategy requires intimate understanding of the data, and to that end STEP Data Profiles can be of great assistance. Data profiles show to what extent relevant attributes are populated, and can highlight the most frequent and rare values and patterns. For more information, see the **Data Profiling** topic.

If a profile is generated from the 'External Products' node, it is possible to see that there are missing values for both OEM and OEM Part Number, and this should be accounted for in the deduplication strategy. Furthermore, as illustrated below, the profile shows that the OEM values include obvious duplicates like 'Craft Parts'/'C'raft part'" and'"Welle"""WELLER INC'" indicating that some form of normalization is required.



Attribute		Complete...	Count	Frequent Values	Rare Values
External Item Descripti	abc	100%	150/150	Dummy description f...	
Last Edited				3/4/15	3/4/15
Last Edited By				STEPSYS	STEPSYS
OEM	abc	98%	147/150	Western, Craft Part...	[None], WELLER IN...
OEM Part Number	abc	99%	149/150	TUW82021, yzo922...	
Source		100%	150/150	Essential Supplies, E...	World Trade Organi...

Count	Value
35	Western
29	Craft Parts
25	OSP Manufacturing
19	Weller
15	MobiHQ
10	Craft parts
7	Mobi HQ
7	WELLER INC.
3	[None]

For OEM Part Number, there are more than 100 distinct values and thus the profile does not, with the default settings, provide exact statistics. Still, it is possible to see that both uppercase and lowercase letters are used and that punctuation is used in some values and not in others. Again, this indicates that normalization will be required.

OEM Part Number	abc	99%	149/150	TUW82021, yzo922...	
Source		100%	150/150	Essential Supplies, E...	World Trade Organi...

Overview | Frequent Values | Rare Values | Frequent Patterns | Rare Patterns

Only show values entered as local values | Export Frequencies

Frequent Values

Count	Value
2	TUW82021
2	yzo92281
2	E200 7591
2	TUW50131
2	95H92971
2	D4-87751
2	95H2581
2	D4-9551
2	YZO61421
2	d4-77601
2	TUW21681

Looking at the frequent patterns info, there are no clear distinct patterns in the values.

Overview | Frequent Values | Rare Values | Frequent Patterns | Rare Patterns

Only show patterns for local values | Export Frequencies

Frequent Patterns

Count	Pattern
26	AAA99999
14	AAA-99999
13	A999A-99999
12	AAAAA99999
12	AA-99999
11	99A99999
10	A99999
10	A9-99999
10	A999 99999
5	A99999999
5	9A99999
5	A999999
3	AAA9999
2	A9999
2	9A9999
2	AAA-9999
1	A999A-9999
1	A999A99999

With two 'matching' attributes, it would be possible to generate two match codes per object, but for this case, this is likely not the best strategy. Thus, the number of different OEM values is quite low, especially if they are normalized, and comparing all items from the same OEM would result in too many comparisons.

As there is a significant spread in OEM Part Number values, generating match codes based solely on these could work. Additionally, you also want a match on OEM and cannot tie a specific OEM Part Number value pattern to an OEM (a match on OEM Part Number is not necessarily a true match). However, this would require that the matching algorithm logic inspected the OEMs later to determine if there is a match or not.

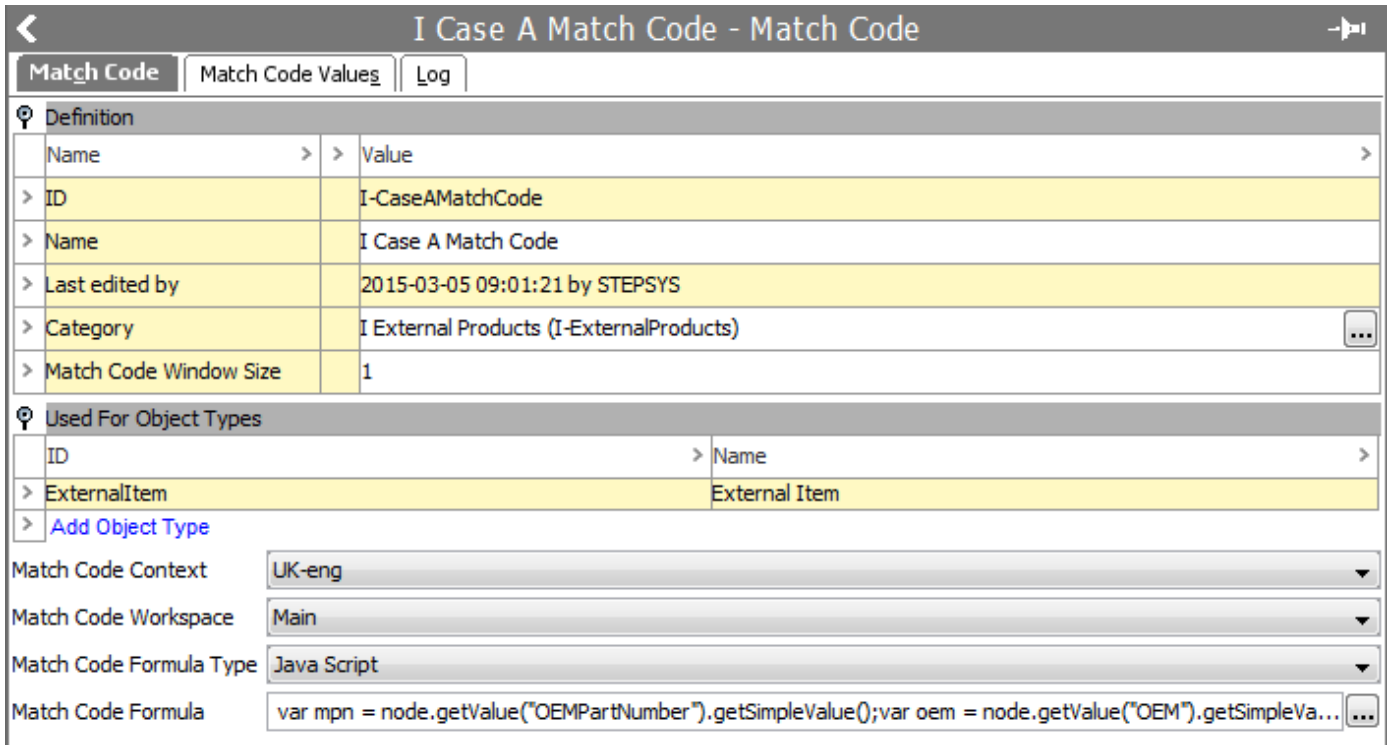
A possible solution is to generate composite match codes that include information from both attributes. If the values are normalized during the match code generation it will, with this approach, be possible to simplify the setup so that identical match codes are automatically considered a match. This can be achieved by working with a Window Size of 1 (only compare objects with the same match code) and have matching algorithm logic that does not check anything, but for each comparison it indicates that there is a match.

Match Code Configuration

The JavaScript below can be used for match code generation ('Current Object' is assumed bound to 'node'). A match code is only generated if there are values for both attributes (two items with missing values are not a match) and basic normalization is applied. For OEM Part Number, punctuation and spaces are removed and the values put in lowercase. For OEM, the same two operations are applied and furthermore, only the first four characters of the values are used, and are separated by a colon (:).

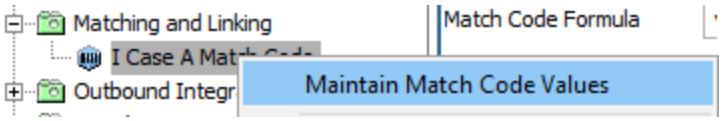
```
var mpn = node.getValue("OEMPartNumber").getSimpleValue();
var oem = node.getValue("OEM").getSimpleValue();
if(oem && mpn) {
   mpn += ""; // Converts to JS string
   mpn = mpn.replace(/[^\w]|_/g, ""); // Leaves only letters and digits
   mpn = mpn.toLowerCase(); // Converts to lowercase
   oem += ""; // Converts to JS string
   oem = oem.replace(/[^\w]|_/g, "");  // Leaves only letters and digits
   oem = oem.substring(0, 4).toLowerCase(); // First 4 characters in lowercase
   return mpn + ":" + oem
}
else {
   return "";
}
```

For an item with OEM Part Number 'D4-90581' and OEM 'Mobi HQ', a match code 'd490581:mobi' would be generated. Likewise, an item with OEM Part Number 'E200 173' and OEM 'Craft Parts' would get a 'e200173:craf' match code, and so forth.

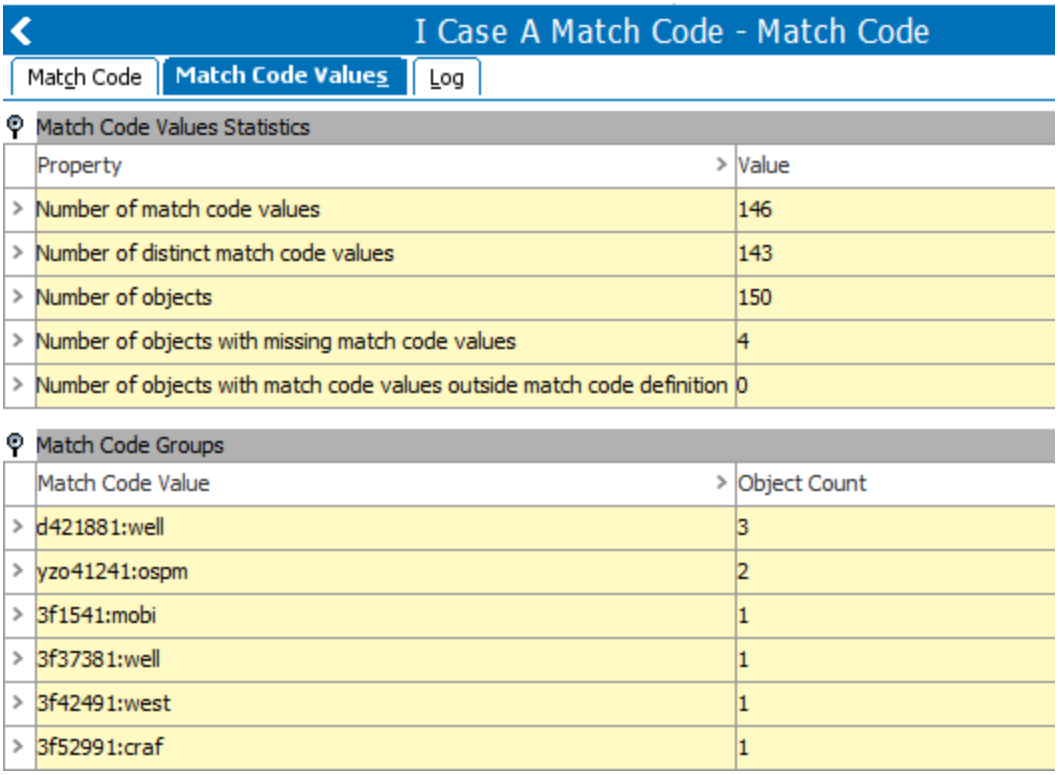


For more information of configuring match codes, see the **Configuring Match Codes** documentation.

When the match code definition has been configured, match codes can be generated from the match code object context menu as shown below. For more information, see the **Generating Match Codes and Running a Matching Algorithm** topic.



Following this, statistics and most common match codes can be inspected via the 'Match Code Values' tab.



I Case A Match Code - Match Code

Match Code | Match Code Values | Log

Match Code Values Statistics

Property	Value
Number of match code values	146
Number of distinct match code values	143
Number of objects	150
Number of objects with missing match code values	4
Number of objects with match code values outside match code definition	0

Match Code Groups

Match Code Value	Object Count
d421881:well	3
yzo41241:ospm	2
3f1541:mobi	1
3f37381:well	1
3f42491:west	1
3f52991:craf	1

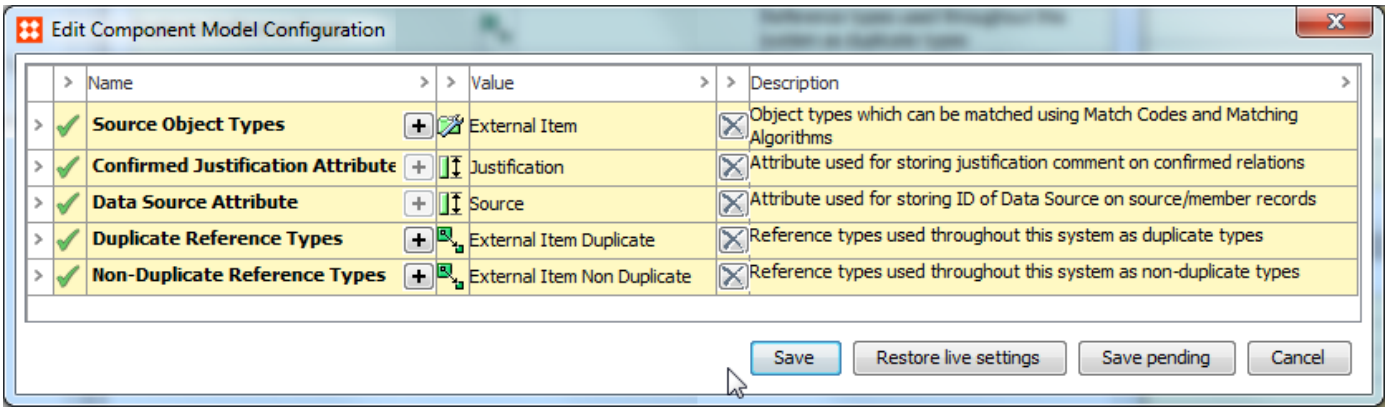
It is possible to see that there are duplicates in the set as three items have the Match Code 'd421881:well' and two items have 'yzo41241:ospm'.

Matching Algorithm Configuration

Matches can be compared, rejected / verified, and potentially merged by configuring and applying a matching algorithm.

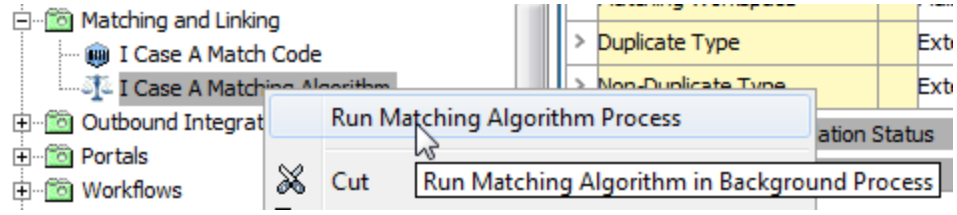
To do this, the matching component model must be configured first. The Source Object Type 'External Item' must be selected along with a Data Source Attribute (in our case 'Source') valid for External Items. Additionally, two different reference types must be configured and selected. These are used to indicate that objects are confirmed as duplicates / non-duplicates and must be valid from External Item to External Item. Finally, an attribute used to hold the justification for confirmations must be selected. This attribute must be valid for the reference types.

For more information on configuring the component model, see the **Component Model Configuration** documentation.



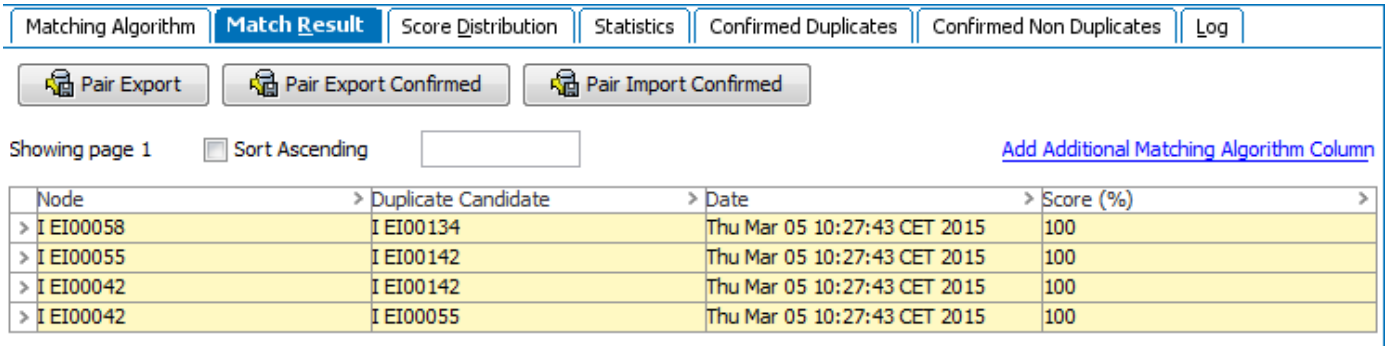
For more information on configuring matching algorithms, see the **Configuring Matching Algorithms Overview** documentation.

Once the matching algorithm has been configured, it can be applied via the object context menu as illustrated in the image below.



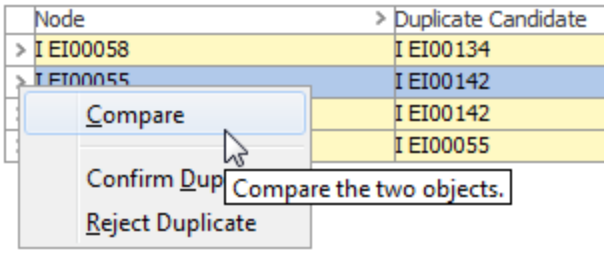
Handling Identified Duplicates

The matches that the matching algorithm finds can be inspected from the matching algorithm 'Match Result' tab.



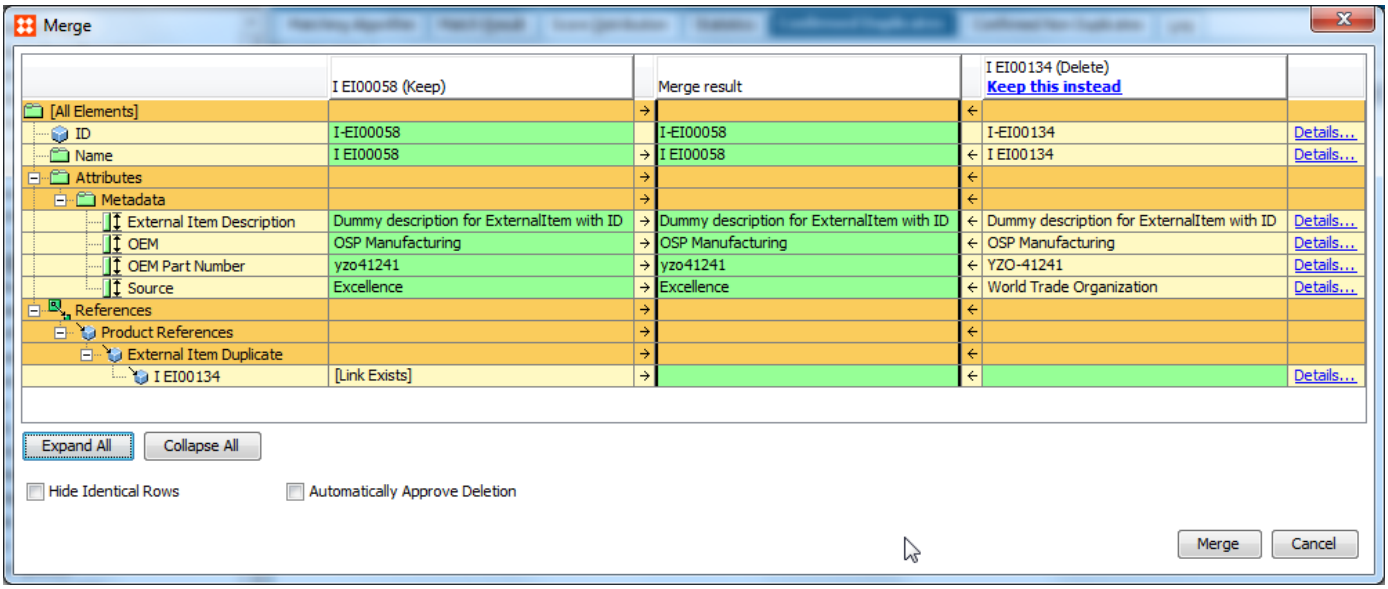
It is important to understand that with the 'Identify Duplicates' match action nothing has happened to the objects at this point. No references or new objects (golden records) have been created. On the 'Match Result' tab you see the pairs that the matching logic has identified as duplicates.

From this tab it is possible to compare pairs and mark them as either confirmed duplicates or confirmed non-duplicates.



It is important to understand that if a pair has been confirmed as duplicates / non duplicates, the pair will not be considered if the Matching Algorithm is re-applied regardless of whether the data on the objects has changed. The confirmed duplicate / non-duplicate relationship can be updated either via the 'Remove From List' option or by deleting the references.

From the 'Confirmed Duplicates' tab, apart from removing a pair, it is also possible to merge a pair into a single record. If this option is selected, then a dialog like the one shown below will open. You can decide which object to keep and manually merge data from the object you choose to delete and the one you wish to keep.



For more information on handling identified duplicates, see the **Handling Identified Duplicates** documentation.

Golden Record Configuration

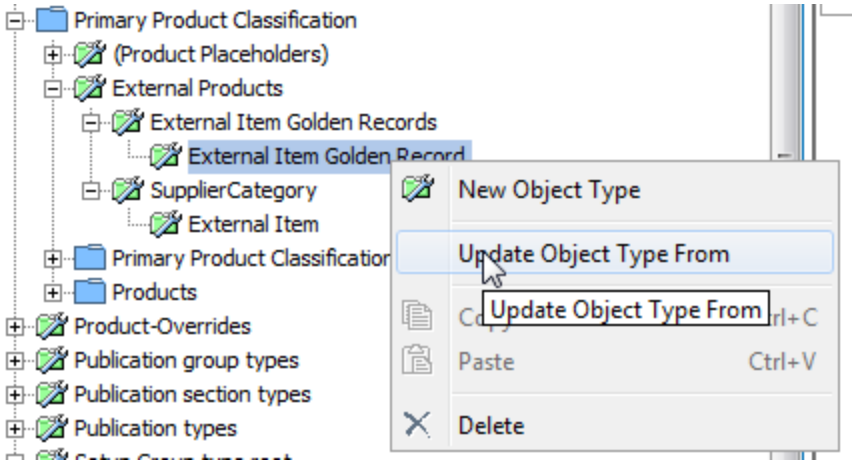
If instead of just identifying (and potentially merging) duplicates you want to have the matching functionality produce golden records, some extra configuration is required.

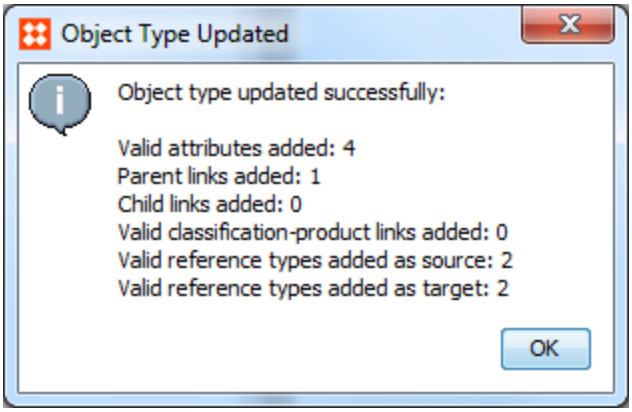
Golden records automatically created by the matching functionality should be of a different object type than the source objects, e.g., 'ExternalItemGoldenRecord'. The golden record object type must have an auto ID pattern configured.

Description

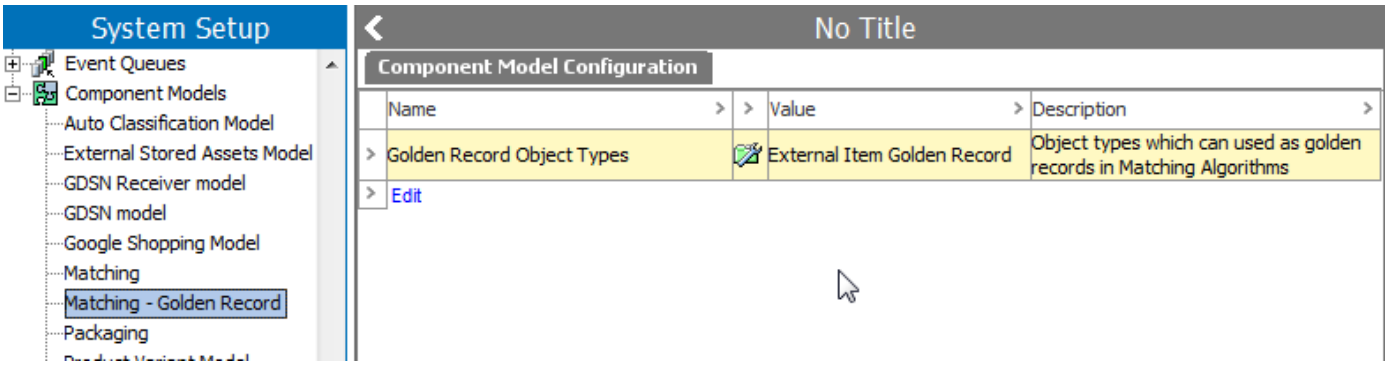
Name	Value
ID	ExternalItemGoldenRecord
Name	External Item Golden Record
Last edited by	2015-03-06 08:37:05 by STEPSYS
Name Pattern	
ID Pattern	ExternalItemGoldenRecord-[id]

Validity-wise, if you intend to copy all data (attribute values and references) from source objects, the golden record object type should have the same valid attributes and be a valid source for the same reference / link types. An easy way to secure this is via the 'Update Object Type From' context menu option as illustrated in the image below.

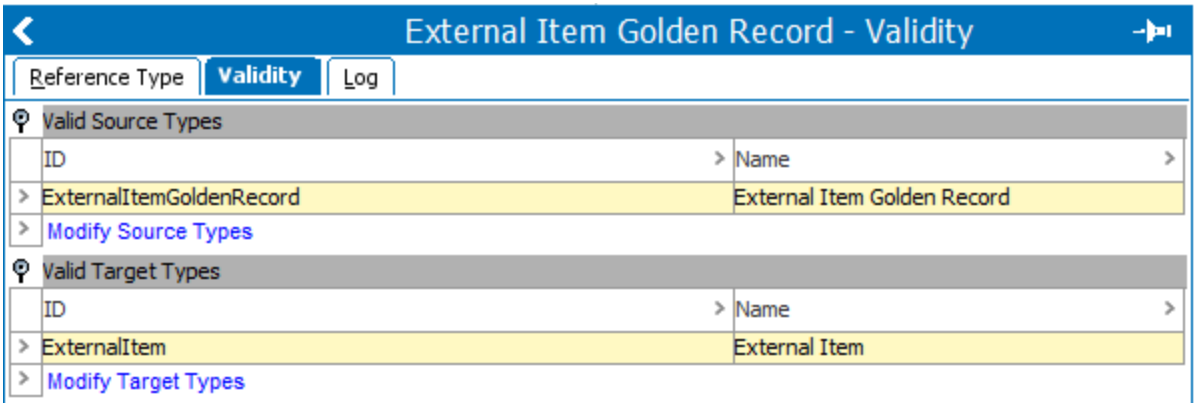




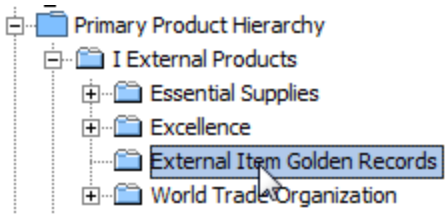
Once an object type for the golden records has been created, it must be selected in the 'Matching – Golden Record' component model as shown below.



In order for golden records to referenced back to their source objects a golden record reference type must be created. The reference type must allow for multiple targets and should be valid from the golden record object type to the source object type.



In addition to this, a root node for the golden records must be created. Initially, all golden records will be created as immediate children of this node.



The golden record object type, the reference type, and the golden records root node must be selected in the Golden Record Match Action on the matching algorithm. You must specify an 'Auto Threshold' and a 'Clerical Review Threshold.'

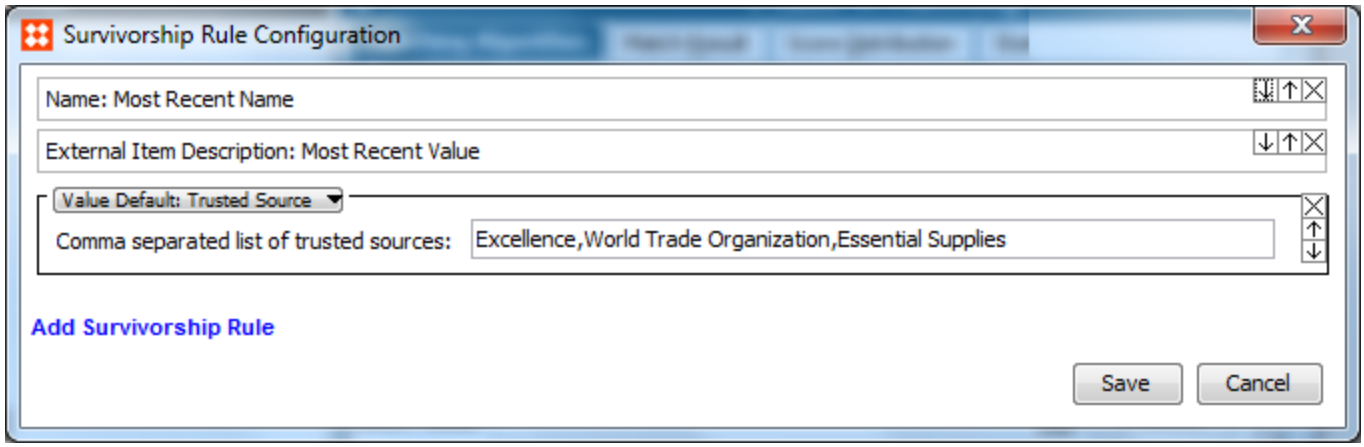
For more information about configuring golden records, see the **Configuring Golden Records** documentation.

Survivorship Rules Configuration

To copy data from source objects to golden records, survivorship rules must be configured. Two different approaches exist for this: 'Most Recent' and 'Trusted Source'. A mixture of these can be used and different rules can be configured for individual pieces of data.

The Trusted Source option takes a comma-separated list of sources as an argument. Notice that it is preferable if the source attribute is LOV based so that you know exactly which values to expect.

In the image below, the survivorship rules have been configured, allowing data to be copied from the External Item Source Objects to the External Items Golden Records.



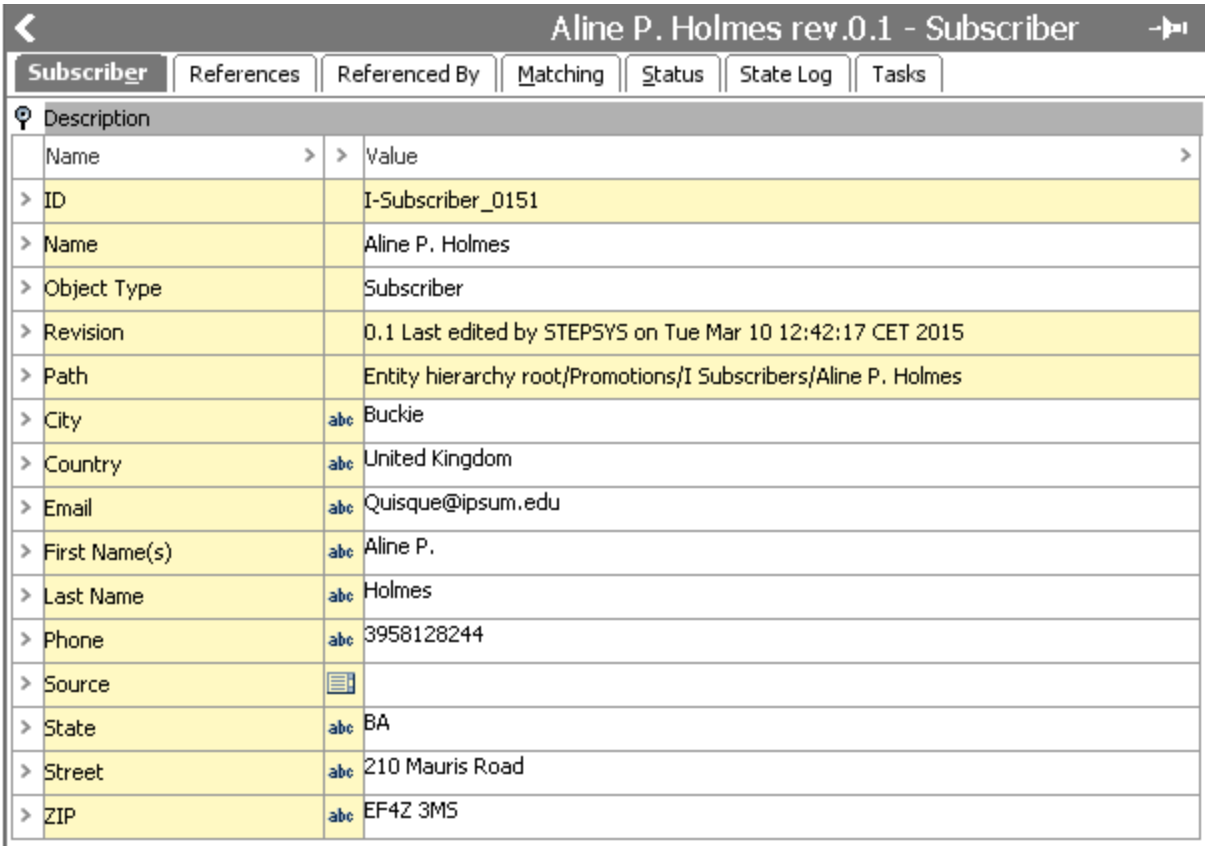
For more information on configuring survivorship rules, see the **Golden Records Survivorship Rules** documentation.

Configuration Example - Advanced

This use case example focuses on more advanced matching logic that could be required when working with data that doesn't have any obvious identifiers.

The source objects for this case, for which duplicates are to be identified, are 200 'Subscriber' objects similar to the one shown below. Each object has the following significant attributes:

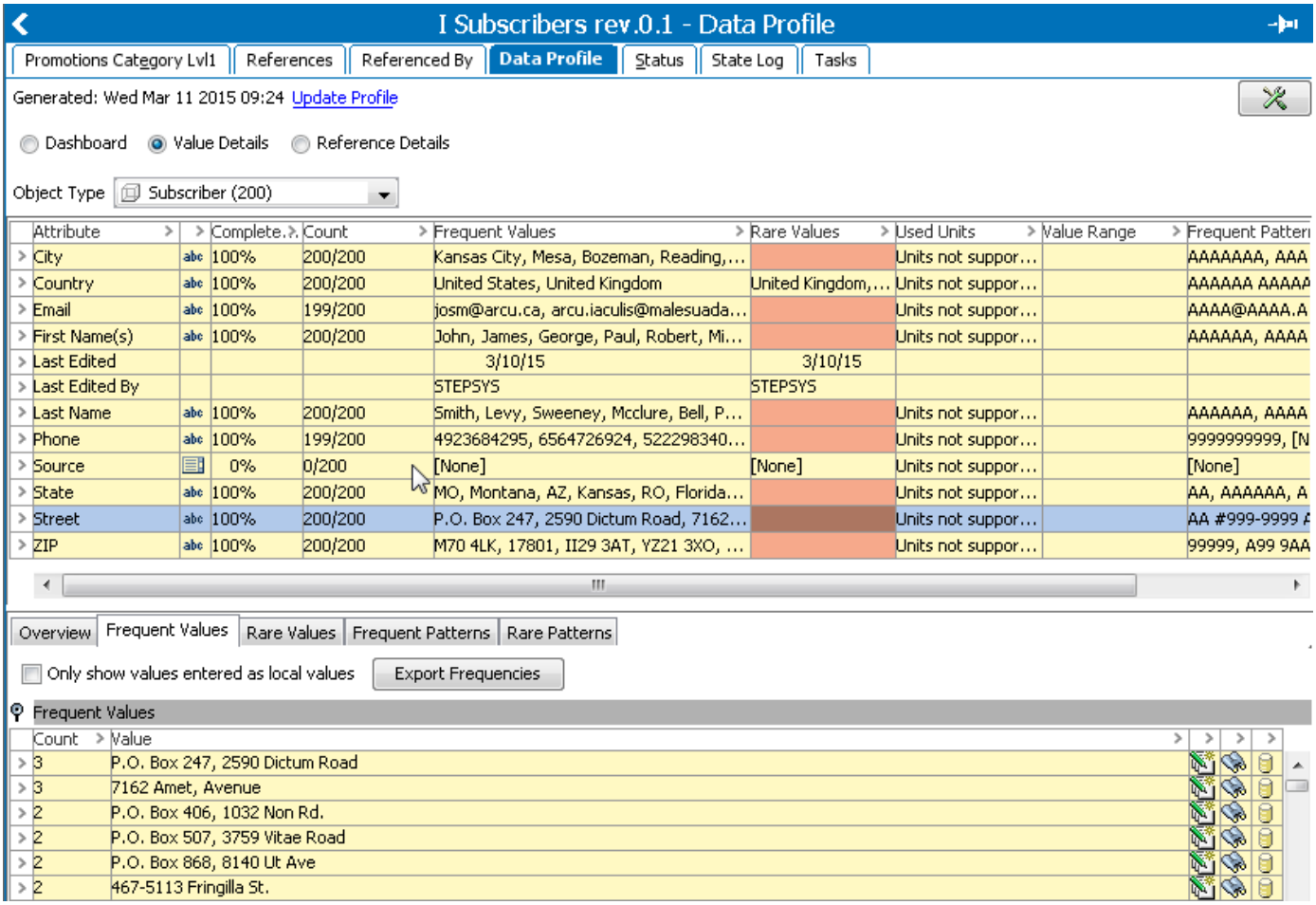
- City
- Country
- Email
- First Name(s)
- Last Name
- Phone
- State (Region)
- Street
- ZIP



Data Profile Analysis

When inspecting the data via the Data Profile functionality, the following can be observed:

- Data is almost complete with a few email addresses and phone numbers missing
- Country is always either 'United Kingdom' or 'United States'
- Street values are not standardized (e.g., different abbreviations are used)
- Phone numbers are standardized and match a uniform pattern (10 digits)



For more information on data profiles, see the **Data Profiles** section of the **Data Profiling** documentation.

There are a multitude of different cases to account for when deduplicating data like this. To give an idea, for this example, the following will be dealt with:

- Nicknames might be used ('Bob' and 'Robert' might be the same person)
- Middle names might be missing or abbreviated in 'First Name(s)' values
- Case (lower / upper) may differ in entered values
- Some names are more common than others

- Subscribers could have changed phone number and/or email address
- Subscribers could have moved
- Street values might have been entered in very different ways

Single field street values are notoriously hard to deal with, so for the strategy detailed, these will only be used as a last resort. Instead, matching will be attempted based primarily on names, phone number, and email address, the logic being that if you have a match on these three pieces of information, there is a high probability that it is in fact the same person. Still, we also need to account for the cases where people have changed either email or phone number.

Library Functions

For the matching process, this example uses a number of JavaScript functions have been declared in a business library with ID 'MatchingFunctions'. These functions can be drawn upon for both pure JavaScript matching algorithms and JavaScript in decision tables. The functions are described below.

Important: The below functions are examples and likely cannot be used in their current form for your business case. Test thoroughly with your own data before implementing in your production STEP system.

Some functions give access to lookup tables. For more information on lookup tables, see the **Transformation Lookup Tables** topic in **Resource Materials** online help.

normalizeValue

The normalizeValue function puts a text in lowercase and removes everything but letters and digits. It can be specified whether the function should only process and return the first word in the text.

```
function normalizeValue(value, handleFirstWordOnly) {
   if(value) {
      var normVal = value + "";
      if(handleFirstWordOnly) {
         normVal = normVal.split(" ")[0];
      }
      normVal = normVal.toLowerCase();
      normVal = normVal.replace(/[^\w]|_/g, "");
      return normVal;
   }
   else {
      return "";
   }
}
```

normalizeStreet

The normalizeStreet function applies basic normalization to 'Street' values and uses a transformation lookup table with ID 'AddressAbbreviations' to replace common abbreviations like 'rd', 'ave' and 'ap' with their full word counterpart.

The logic reads:

- Convert input to JavaScript string
- Convert to lowercase
- Remove all instances of (.), (,), and (#) (more characters should probably be removed, but be careful removing dashes if used in street number ranges)
- Split the string by space characters and loop through the array of words applying the lookup table
- Piece together the string again and return it

Lookup Table

Replace with default value when no matches are found (Value Substitution only):

Ignore Case

From	To
aly	alley
anx	annex
apt	apartment
arc	arcade
ave	avenue
bch	beach
bg	burg
bldg	building
blf	bluff
blvd	boulevard
bnd	bend
br	branch

```
function normalizeStreet(input, lookupTableHome) {
   var output = "";
   if(input) {
      input = input + "";
      input = input.toLowerCase();
      input = input.replace(/[\.\,#]|_/g, "");
      var inArr = input.split(" ");
      var outArr = [];
```

```
        for(var i = 0; i < inArr.length; i++) {
    outArr.push(lookupTableHome.getLookupTableValue("AddressAbbreviations", inArr
    [i]));
        }
        for(var j = 0; j < outArr.length; j++) {
           output += outArr[j];
           if(j != outArr.length - 1) {
              output += " ";
           }
        }
     }
     return output;
}
```

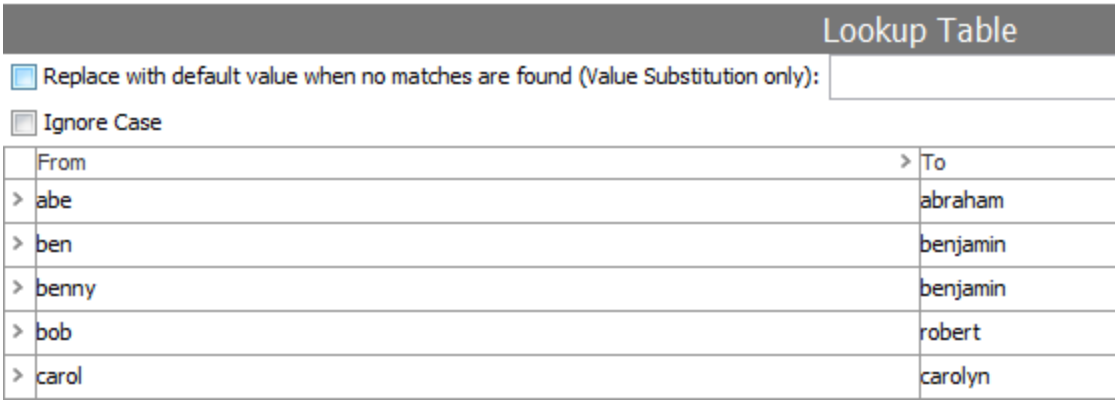
nameComparison

The purpose of the nameComparison function is to produce a value between 0 and 1 indicating how good a match a name is. Apart from 'manager' and 'lookupTableHome' that are passed as arguments (because you cannot create bindings from library functions), the function takes six arguments:

- firstName1 – Normalized value of the 'First Name(s)' attribute for the first of the two objects being compared (normalized via normalizeValue returning only first word)
- lastName1 – Normalized value of the 'Last Name' attribute for the first of the two objects being compared (normalized via normalizeValue)
- firstName2 – Normalized value of the 'First Name(s)' attribute for the second of the two objects being compared (normalized via normalizeValue returning only first word)
- lastName2 – Normalized value of the 'Last Name' attribute for the second of the two objects being compared (normalized via normalizeValue)
- commonNameFactor – A number between 0 and 1 indicating how hard common names like 'John Smith' should be punished. The lower the number, the harder the punishment. Typical range between 0.8 and 9.9.
- nicknameMatchFactor – A number between 0 and 1 indicating how hard nickname matches should be punished. The lower the number, the harder the punishment. Typical range between 0.8 and 1.
- lastNameWeightFactor – A number between 0 and 1 indicating how important a rare last name is compared to a rare first name

Basically, the function first produces a string for each object being compared. It consists of the normalized first name, a colon, and the normalized last name. If the two strings are identical, the function will call the function getFullNameWeight passing commonNameFactor and lastNameWeight as arguments. This function will return a value between 0 and 1 based on how common the name is and this value will also be the return value for nameComparison. 'John Smith' will produce a low value while a more uncommon name will produce a higher value. The functionality of getFullNameWeight is described further down.

If the two generated strings are not identical, nameComparison will check whether the last names are identical. If this is the case, a transformation lookup table with ID 'Nicknames' will be used to check if there is a match when common nicknames, like 'Bill', are replaced with full names like 'William'. If there is a match after the nickname replacement, the getFullNameWeight function is used again to produce a common name weight and this weight is multiplied with the nicknameMatchFactor and returned. It should be noted that in this simplified setup, cases like 'Ben', mapping to both 'Benjamin' and 'Benedict' are not handled in the nickname matching.



If none of the above is true, a value of 0 indicating no match is returned. The complete function can be seen below.

```
function nameComparison(normFirstName1, normLastName1, normFirstName2,
normLastName2, manager, lookupTableHome, commonNameFactor, nicknameMatchFactor,
lastNameWeightFactor) {

   var nameMatchValue = 0;

   var normName1 = null;

   if(normFirstName1 && normLastName1) {

      normName1 = normFirstName1 + ":" + normLastName1;

   }

   var normName2 = null;

   if(normFirstName2 && normLastName2) {

      normName2 = normFirstName2 + ":" + normLastName2;

   }

   if(normName1 && normName2) {

      if(normName1 == normName2) {

         nameMatchValue = getFullNameWeight(normFirstName1, normLastName1,
manager, lookupTableHome, commonNameFactor, lastNameWeightFactor);

      }

      else if(normLastName1 && normLastName2 && normLastName1 == normLastName2)
{

         var lookup1 = lookupTableHome.getLookupTableValue("Nicknames",
normFirstName1) + "";
```

```
            var lookup2 = lookupTableHome.getLookupTableValue("Nicknames",
normFirstName2) + "";
            if(lookup1 == lookup2) {
               var fullNameWeight = getFullNameWeight(lookup1, normLastName1,
manager, lookupTableHome, commonNameFactor, lastNameWeightFactor);
nameMatchValue = fullNameWeight * nicknameMatchFactor;
            }
         }
      }
      return nameMatchValue;
}
```

getNameWeight and getFullNameWeight

In order to produce a metric for how common a name is, the getFullNameWeight function mentioned above and its helper function getNameWeight uses two transformation lookup tables: 'FirstNameFrequencies' and 'LastNameFrequencies' that contain frequency information for the most common first names and last names.

Transformation Lookup Table

Description

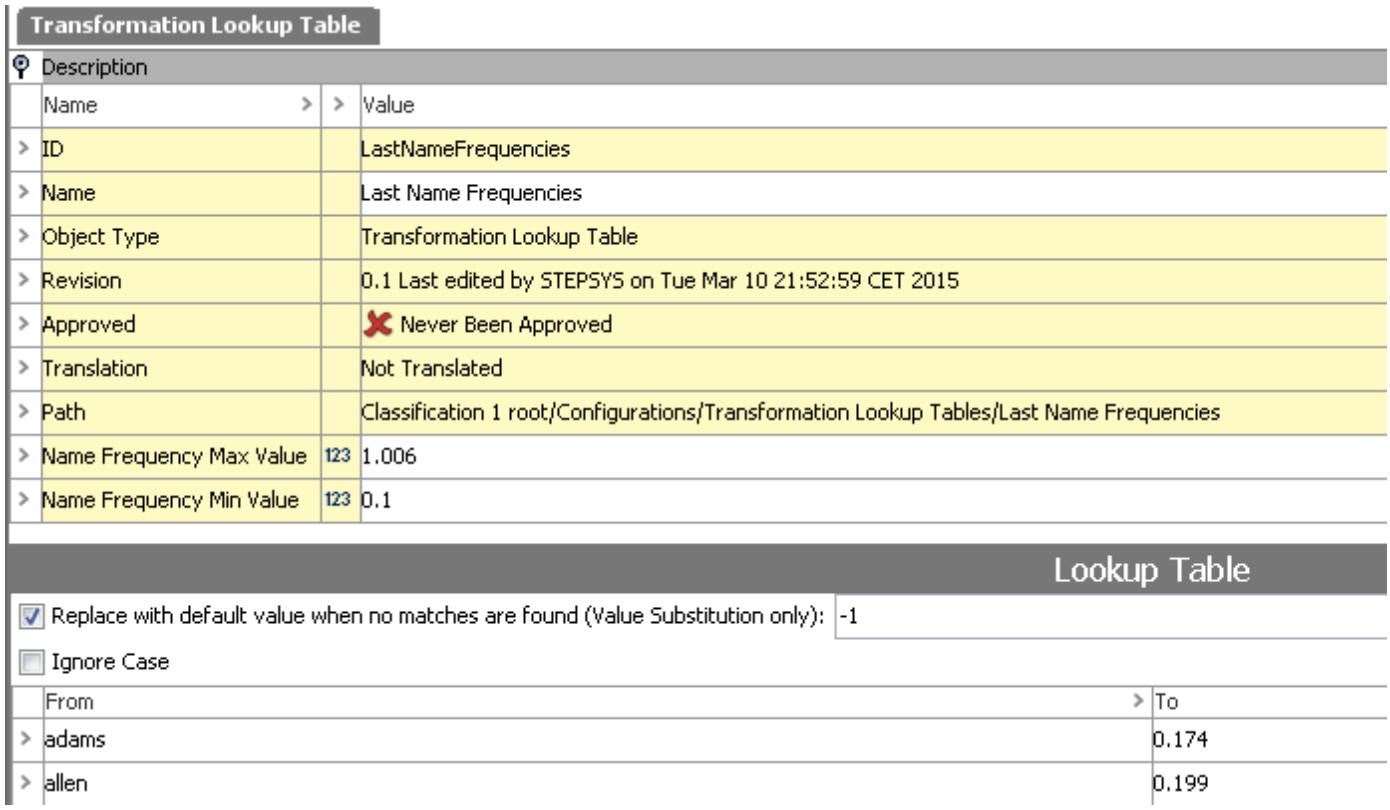
Name		Value
ID		FirstNameFrequencies
Name		First Name Frequencies
Object Type		Transformation Lookup Table
Revision		4.0 Last edited by STEPSYS on Fri Mar 13 12:02:12 CET 2015
Approved		Never Been Approved
Translation		Not Translated
Path		Classification 1 root/Configurations/Transformation Lookup Tables/First Name Frequencies
Name Frequency Max Value	123	3.271
Name Frequency Min Value	123	0.101

Lookup Table

Replace with default value when no matches are found (Value Substitution only): -1

Ignore Case

From	To
aaron	0.24
adam	0.259
alan	0.204



Transformation Lookup Table

Description

Name	Value
ID	LastNameFrequencies
Name	Last Name Frequencies
Object Type	Transformation Lookup Table
Revision	0.1 Last edited by STEPSYS on Tue Mar 10 21:52:59 CET 2015
Approved	Never Been Approved
Translation	Not Translated
Path	Classification 1 root/Configurations/Transformation Lookup Tables/Last Name Frequencies
Name Frequency Max Value	1.006
Name Frequency Min Value	0.1

Lookup Table

Replace with default value when no matches are found (Value Substitution only): -1

Ignore Case

From	To
adams	0.174
allen	0.199

Note: The frequencies are obtained from U.S. Census and are thus, strictly speaking, not representative for UK names. However, for this example they will suffice.

The getNameWeight function is called from getFullNameWeight and works either on a first name or a last name using the appropriate lookup table to produce a metric. In this simplified setup, the function produces a number between 1 and commonNameFactor (initially supplied to nameComparison as an argument) based on the frequencies in the lookup table. If a name is not on the list, it will get a value of 1 indicating that it is an uncommon name.

getFullNameWeight uses lastNameWeightFactor (also supplied to nameComparison as an argument) to produce a weighted average of the first name and last name weight. Both functions are shown below.

```
function getNameWeight(name, manager, lookupTableHome, isFirstName, minWeight)
{
   var newMax = 1;
   var newMin = minWeight;
   var lookupTableID;
   if(isFirstName) {
      lookupTableID = "FirstNameFrequencies";
   }
   else {
```

```
      lookupTableID = "LastNameFrequencies";
   }
   var lookupValue = parseFloat(lookupTableHome.getLookupTableValue
(lookupTableID, name));
   var returnValue;
   if(lookupValue == -1) {
      returnValue = newMax;
   }
   else {
      var origMax = parseFloat(manager.getAssetHome().getAssetByID
(lookupTableID).getValue("NameFrequencyMaxValue").getSimpleValue());
      var newRange = newMax - newMin;
      returnValue = ((-1 * (newRange / origMax)) * lookupValue) + 1;
   }
   return returnValue;
}


function getFullNameWeight(firstName, lastName, manager, lookupTableHome,
minWeight, lastNameWeightFactor) {
   var firstNameWeight = getNameWeight(firstName, manager, lookupTableHome,
true, minWeight);
   var lastNameWeight = getNameWeight(lastName, manager, lookupTableHome,
false, minWeight);
   return (firstNameWeight * (1 - lastNameWeightFactor)) + (lastNameWeight *
lastNameWeightFactor);
```

Matching Algorithm Configuration

In this example, the matching algorithm logic will be implemented via a decision table drawing upon the library functions described above.

For more information on configuring matching algorithms, see the **Configuring Matching Algorithms Overview** documentation.

Global Binds

For performance reasons, all attribute values used in the decision table comparison will be obtained via global binds. The configuration can be seen below.

Global Binds

Name	Refers to
phone	Attribute Value: Phone
mail	Attribute Value: Email
country	Attribute Value: Country
firstName	Attribute Value: First Name(s)
lastName	Attribute Value: Last Name
zip	Attribute Value: ZIP
state	Attribute Value: State
street	Attribute Value: Street

Transformer Expressions

When using decision tables, it is recommended to separate the different parts of the logic, making it easier to maintain and fine tune. In this example, transformer expressions are used for normalization, and thus, this part of the logic is separated from the comparison part. The transformers are described below:

- **normPhone Transformer Expression**

  This transformer uses the normalizeValue library function to normalize phone number values obtained via the 'phone' global bind ('Match Expression Context' is bound to 'mec').

```
return mf.normalizeValue(mec.evaluate("phone"), false);
```

- **normEmail Transformer Expression**

  For email, normalizeValue cannot be used, as punctuation should not be removed. Instead, values are put in lowercase.

```
var input = mec.evaluate("mail");
if(input) {
   return input.toLowerCase();
}
else {
   return "";
}
```

- **normFirstName Transformer Expression**

  Similar to normPhone, normFirstName uses the normalizeValue library function but normalizes and returns only the first word in the first name values.

```
return mf.normalizeValue(mec.evaluate("firstName"), true);
```

- **normLastName Transformer Expression**

Similar to normPhone.

```
return mf.normalizeValue(mec.evaluate("lastName"), false);
```

- **normCountry Transformer Expression**

  Similar to normPhone.

  ```
  return mf.normalizeValue(mec.evaluate("country"), false);
  ```

- **normZip Transformer Expression**

  Analog to normPhone.

  ```
  return mf.normalizeValue(mec.evaluate("zip"), false);
  ```

- **normStreet Transformer Expression**

  For normStreet the normalizeStreet library function is used. 'Lookup Table Home' is bound to 'LookupTableHome' and passed as an argument along with the street value.

  ```
  return mf.normalizeStreet(mec.evaluate("street"), lookupTableHome);
  ```

>	normPhone	Transformer	JavaScript Function: Bindings, return mf.normalizeValue(mec.evaluate("phone"));
>	normEmail	Transformer	JavaScript Function: Bindings, var input = mec.evaluate("mail");if(input) {return input.toLowerCase();}else {return "";}
>	normFirstName	Transformer	JavaScript Function: Bindings, return mf.normalizeValue(mec.evaluate("firstName"), true);
>	normLastName	Transformer	JavaScript Function: Bindings, return mf.normalizeValue(mec.evaluate("lastName"), false);
>	normCountry	Transformer	JavaScript Function: Bindings, return mf.normalizeValue(mec.evaluate("country"), false);
>	normZip	Transformer	JavaScript Function: Bindings, return mf.normalizeValue(mec.evaluate("zip"), false);
>	normStreet	Transformer	JavaScript Function: Bindings, return mf.normalizeStreet(mec.evaluate("street"), lookupTableHome);

Constants

To make it easier to fine tune the matching logic, all constants used in the algorithm are represented as constant expressions. The constants are described below.

- **commonNameFactor Constant Expression**

  Constant used for punishing common names. Most common names would get a value equal to or close to this number. Rare names will get a value of 1. Initially set to 0.9.

- **nicknameMatchFactor Constant Expression**

  Constant used for punishing nickname replacements. Initially set to 0.85.

- **nonMatchingPhoneOrEmailFactor Constant Expression**

  Constant used for punishing non-matching phone or emails. Initially set to 0.95.

- **nonMatchingPhoneAndEmailFactor Constant Expression**

  Constant used for punishing cases where neither phone or email match. Initially set to 0.8.

- **lastNameWeightFactor**

  Importance of last name compared to first name. Initially set to 0.6. In the getFullNameWeight library function, the constant will be used as follows: ([First Name Weight] * (1 – lastNameWeightFactor)) + ([Last Name Weight] * lastNameWeightFactor)

Comparator Expressions

- **phoneMatch Comparator Expression**

  The phoneMatch Expression works on normalized phone numbers and returns 1 (true) if there is a phone value for both objects being compared and they are identical. Otherwise 0 (false) is returned.

```
var phone1 = mec.evaluate("normPhone", "first");
var phone2 = mec.evaluate("normPhone", "second");
return (phone1 && phone2 && phone1 == phone2) ? 1 : 0;
```

- **emailMatch Comparator Expression**

  The emailMatch Expression is identical to the phoneMatch Expression described above, but works on normalized email values instead.

```
var email1 = mec.evaluate("normEmail", "first");
var email2 = mec.evaluate("normEmail", "second");
return (email1 && email2 && email1 == email2) ? 1 : 0;
```

- **nameMatchValue Comparator Expression**

  The nameMatchValue Expression invokes the nameComparison library function and returns the result. Notice how the constants described above are referenced via the match expression context.

```
return mf.nameComparison(
   mec.evaluate("normFirstName", "first"),
   mec.evaluate("normLastName", "first"),
   mec.evaluate("normFirstName", "second"),
   mec.evaluate("normLastName", "second"),
   manager,
   lookupTableHome,
   parseFloat(mec.evaluate("commonNameFactor")),
   parseFloat(mec.evaluate("nicknameMatchFactor")),
   parseFloat(mec.evaluate("lastNameWeightFactor"))
);
```

- **countryZipMatch Comparator Expression**

countryZipMatch works in the same way as phoneMatch and emailMatch, but concatenates on the country and zip values before comparison.

```
var country1 = mec.evaluate("normCountry", "first");
var country2 = mec.evaluate("normCountry", "second");
var zip1 = mec.evaluate("normZip", "first");
var zip2 = mec.evaluate("normZip", "second");
if(country1 && country2 && zip1 && zip2) {
   return (country1 + zip1) == (country2 + zip2) ? 1 : 0;
}
else {
   return 0;
}
```

- **streetEditDistance Comparator Expression**

  streetEditDistance uses the built-in levenshteinDistance function to get the edit distance between normalized street values. 'Matching Functions' have been bound to 'coreMatchingFunctions'.

```
var street1 = mec.evaluate("normStreet", "first");
var street2 = mec.evaluate("normStreet", "second");
return coreMatchingFunctions.levenshteinDistance(street1, street2);
```

Rules Setup

Based on the expressions described above, the rules shown below can be configured. Notice that this is just an example and that equally good or better rules could be configured. Also, notice how only STEP functions can be used for calculations in the Result column. Thus expression values are referenced via the STEP function mcevaluate("ExpressionID").

Rules

phoneMatch	emailMatch	nameMatchVa...	countryZipMatch	streetEditDistance	Result	Comment
= 1	= 1				99.9	
= 1					100 * mcevaluate("nameMatchValue") * mcevaluate("nonMatchingPhoneOrEmailFactor")	
	= 1				100 * mcevaluate("nameMatchValue") * mcevaluate("nonMatchingPhoneOrEmailFactor")	
		> 0	= 1	< 2	100 * mcevaluate("nameMatchValue") * mcevaluate("nonMatchingPhoneAndEmailFactor")	

Add Rule

The rules state the following:

- If there is a match on both phone and email, there is a very high probability that it is the same person, and '99.9' is returned regardless of how well the name and address values match.
- If there is a match on phone only, the nameMatchValue is multiplied with 100 and the nonMatchingPhoneOrEmailFactor value, and returned.
- If there is a match on email only, the nameMatchValue is multiplied with 100 and the nonMatchingPhoneOrEmailFactor value, and returned.

- If neither phone nor email match, but there is a match on name (nameMatchValue > 0) AND a match on country and zip AND the edit distance between street values is less than 2, nameMatchValue is multiplied with 100 and the nonMatchingPhoneAndEmailFactor value, and returned.

Match Code Configuration

Given the logic outlined above, you will need to make sure that subscriber objects get compared if they either have the same email, same phone number, or same name and approximate location. To this end, if data is complete for a subscriber object, three match codes will be generated:

- Prefix 'PHONE-' concatenated with the phone number
- Prefix 'MAIL-' concatenated with the email
- Prefix 'NAMEADDR-' concatenated with normalized first name, last name, country, and zip

Notice that with a big data set, the last match code probably would not work as it would cause too many comparisons. For example, John Smiths with the same ZIP Code.

A JavaScript version of the match code formula is shown below. Based on the match codes, the matching can be run with a Window Size of 1. In the code below, it is assumed that 'Current Object' has been bound to 'node' and that a dependency to the 'Matching Functions' library has been declared, giving access to the library via the JavaScript variable 'mf'.

```
var normFirstName = mf.normalizeValue(node.getValue("S-
FirstNames").getSimpleValue(), true);

var normLastName = mf.normalizeValue(node.getValue("S-LastName").getSimpleValue
(), false);

var normCountry = mf.normalizeValue(node.getValue("S-Country").getSimpleValue
(), false);

var normZip = mf.normalizeValue(node.getValue("S-ZIP").getSimpleValue(),
false);


var nameAddr = "";

if(normFirstName && normLastName && normCountry && normZip) {

   nameAddr = normFirstName + ":" + normLastName + ":" + normCountry + ":" +
normZip;

}

var mail = node.getValue("S-Email").getSimpleValue();

var phone = node.getValue("S-Phone").getSimpleValue();


var mcArr = [];

if(nameAddr) mcArr.push("NAMEADDR-" + nameAddr);

if(mail) mcArr.push("MAIL-" + mail);

if(phone) mcArr.push("PHONE-" + phone);
```

```
if(mcArr.length > 0) return mcArr;
else return "";
```

For more information of configuring match codes, see the **Configuring Match Codes** documentation.

Search Before Create

Before creating new objects, Matching Algorithms can be used to search for similar existing objects in STEP, ensuring duplicates are not created.

The matching logic is applied by comparing potential new objects with that of existing objects. More specifically, match codes are generated for the incoming objects, compared to existing objects with similar match codes, and if matches have been made, a list is returned of all matched objects with rank scores that met or exceeded the configured threshold in the request. Using this list, the user can decide whether to create a new object or use the existing one.

Matching logic can be applied to three different 'Search Before Create' methods:

- The 'Duplicate Handler' on an Initiate Item workflow screen in Web UI
- The 'Find Similar' search on an Add Reference action in Web UI
- 'GetSimilarObject' SOAP web service request

For more information on Find Similar, see the **Find Similar** section of the **Web User Interfaces** documentation.

For complete documentation for Web Services functionality related to GetSimilarObjects, click the **STEP API Documentation** button on the STEP Start Page and see the SOAP API section.

GetSimilarObject Match Codes and Match Algorithm

When configured to work with GetSimilarObject, special considerations should be made for the solution's match codes and matching algorithm.

Match Codes

Attribute value binds in the match code definition should be created specifically for GetSimilarObject cases.

For example:

```
if ( node == null ) {
        //generate matchcodes for getSimilarObject
}
else {
        //generate matchcodes for existing objects
}
```

Note: When used for GetSimilarObject, it is safe to establish large match code groups without impacting performance.

For more information, see the **Configuring Match Codes** section of the documentation.

Match Algorithm

Matching Algorithm global binds should be configured to map the attributes used in the SOAP request. 'Mcevaluate' / 'evaluate' should be used in the match criterion's STEP function / JavaScript function to retrieve these values when the current object returns null.

Note: It is recommended practice to use the decision table match criteria for this purpose.

When decision tables are used as the match criteria, any configured party data normalizers require that all configured attributes also exist as global binds. This applies to both explicitly configured attributes and for those configured via component models.

So, for example, if the Address Normalizer is used for GetSimilarObjects, the country, region, city, postcode, and street attributes must have corresponding global binds.

Important: For customer data normalizers, the name of the global bind must match the ID of the corresponding attribute.

Customer data normalizers are compatible with GetSimilarObject so long as global binds are set on the matching algorithm.

For more information on global binds and match criteria, see the **Configuring Matching Algorithms** section of the documentation.

Generating Match Codes and Running a Matching Algorithm

In order to stay up-to-date with changes to data in STEP, you must maintain the matching components by periodically regenerating match codes and re-running matching algorithms.

- Generating and updating match codes can be handled using an event processor, or can be performed manually (as described below).
- Running the matching algorithm requires an event processor and can be triggered automatically or initiated manually (as described below).

For information using an event processor to handle maintenance tasks automatically, see the **Configuring Matching Event Processor** documentation.

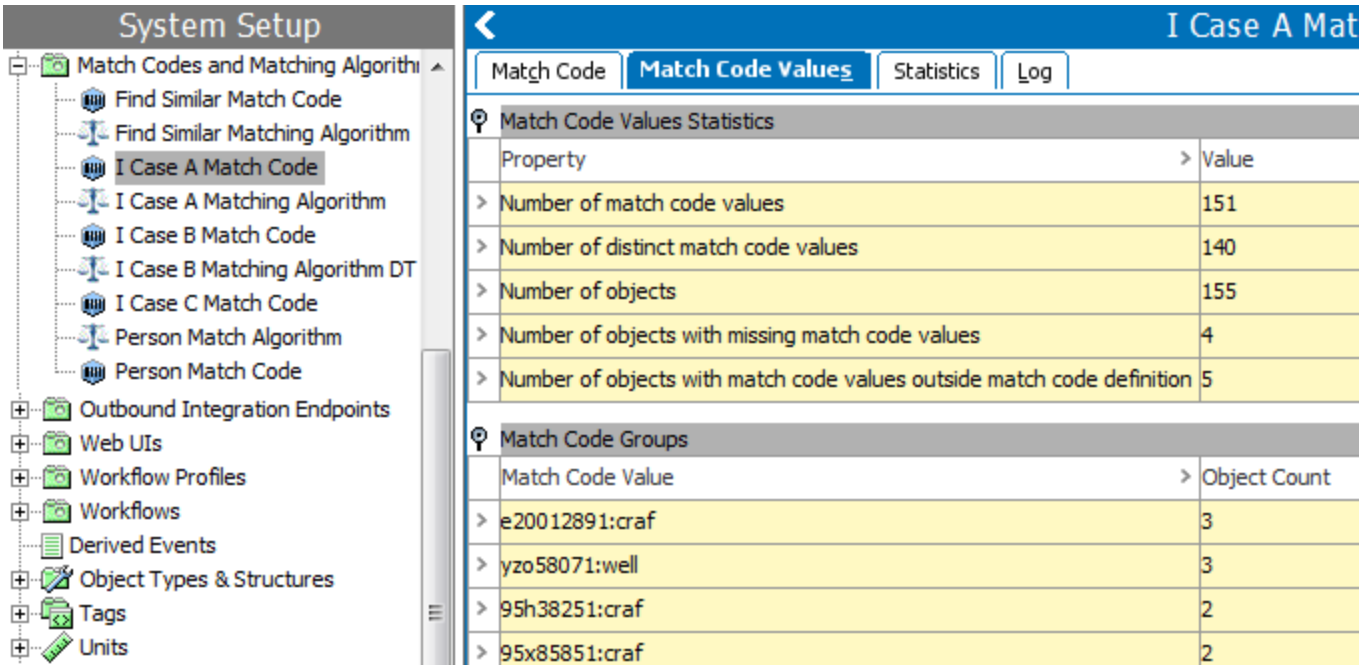
Note: The Event Processor object needs to be created in advance and will, when used for Matching, Linking, and Merging, reference a Matching Algorithm object and process the Events generated asynchronously.

Match Code Values

Match code values are based on object type and optionally, a category (the parent node for the object in the hierarchy). Once a match code value exists, changing the object type or moving the object may cause the object to fall outside the match code value definition, making it invalid.

Match Code Values Statistics

The Match Code editor includes a Match Code Values Statistics flipper that displays the number of existing, missing, and invalid match code values. This data allows you to determine the maintenance tasks required to update your match code values. The invalid match code values should be removed prior to running the matching algorithm. Ideally, all objects will have a match code value and no values will be outside the match code definitions.



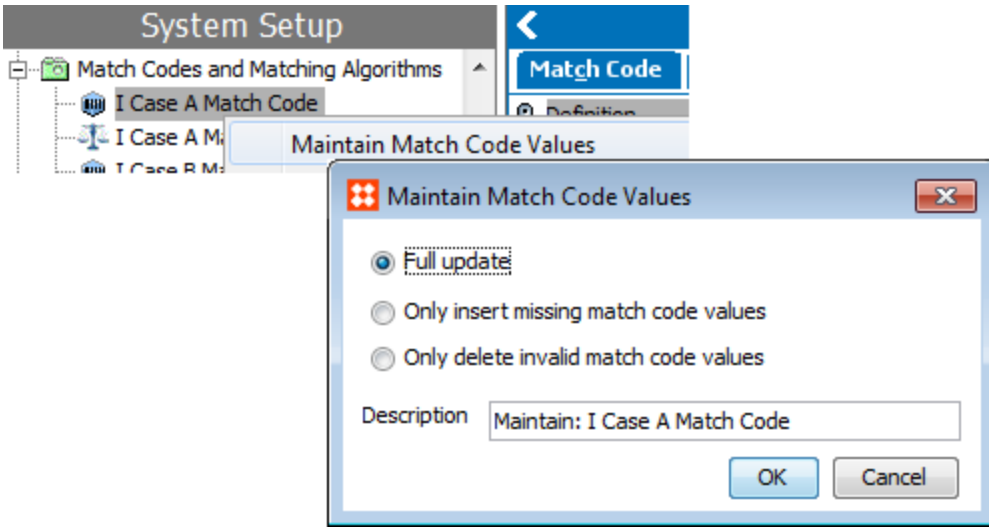
Note: The 'Maintain Match Code Values' functionality is controlled by System Setup > Action Sets > Setup Actions > Maintain Deduplication Configurations.

Maintain Match Code Values

When creating a new match code, the initial generation of match code values can be accomplished with the 'Maintain Match Code Values' option or by running a matching event processor with the Generate / Update Match Code Values option selected.

Important: The manual 'Maintain Match Code Values' process is required when the match code changes since this type of edit does not trigger events.

1. Verify a configured match code exists by following the steps defined in the **Configuring Match Codes** documentation.
2. Right-click on the match code node and select the 'Maintain Match Code Values' option.



3. In the 'Maintain Match Code Values' dialog, select the radio button for the desired action:
   - **Full update** updates existing match codes values, inserts missing match code values, and deletes invalid match code values. This default option is required for a new match code and creates a match code value for all objects that meet the match code criteria.
   - **Only insert missing match code values** is faster than a full update since it does not include updating or removing match code values. This option addresses the objects that are counted in the 'Number of objects with missing match code values' statistic. For example, after loading new objects, use this option to generate match codes for the new objects only, instead of regenerating match codes for all objects.
   - **Only delete invalid match code values** is faster than a full update since it does not include updating or adding match code values. This option addresses the objects that are counted in the 'Number of objects with match code values outside match code definition' statistic. For example, when the match code definition has been updated to exclude objects (because the object type has changed), use this option to only remove the match codes for the excluded objects, instead of regenerating match codes for all objects.
4. Click **OK** to generate / update match code values.

Run Matching Algorithm

Once match code values have been generated, you can run a matching algorithm, which requires an event processor. The 'Generate Events for Matching' option is a way of getting **all** objects in the matching algorithm definition into the queue to be matched. This option is useful when testing and fine-tuning your algorithm, as well as for running against all objects once an algorithm has been finalized.

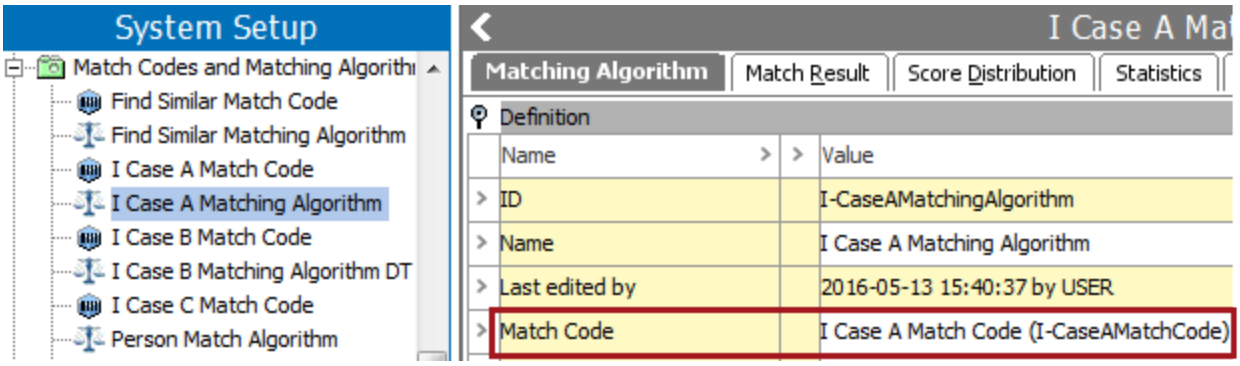
Important: The manual 'Generate Events for Matching' process is required when the matching algorithm definition changes since events are not triggered.

---

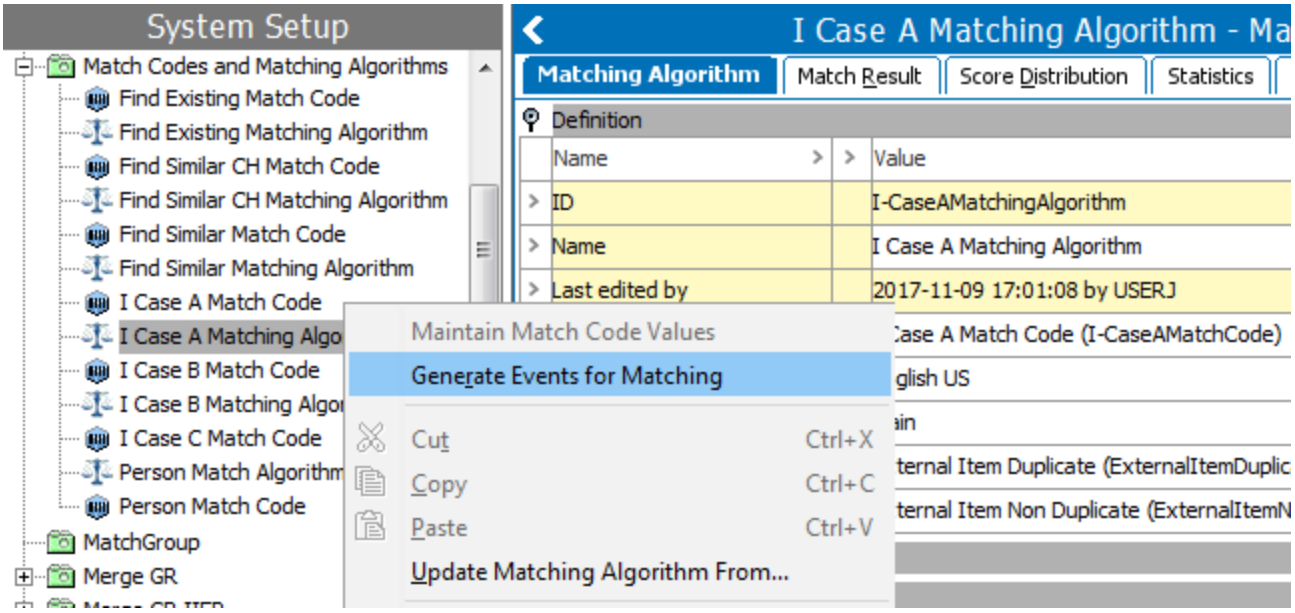
1. Create an event processor with the desired matching algorithm selected on the Configure Processing Plugin step. For detailed steps, see the **Configuring Matching Event Processor** section of the **Event Processor**

documentation.

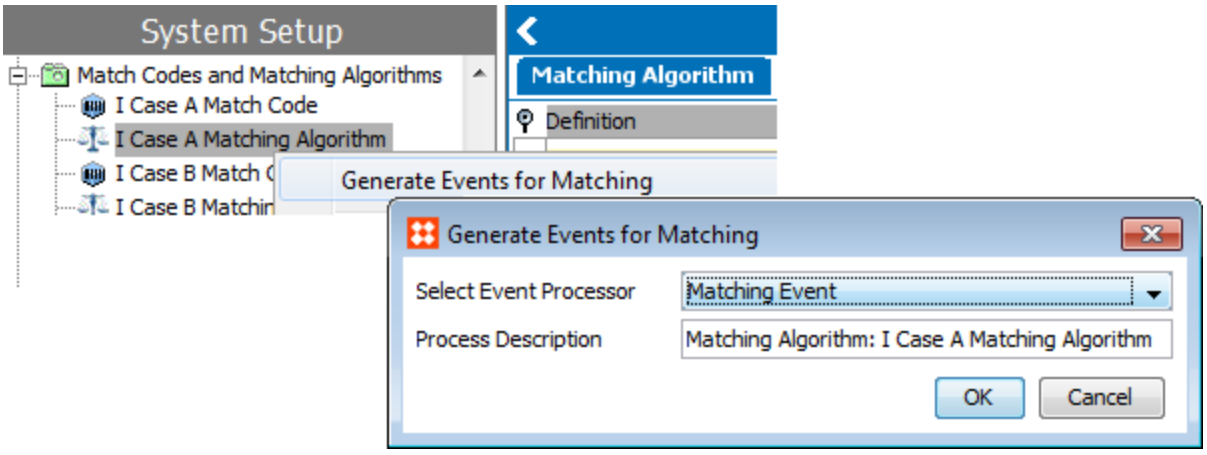
2. Select the desired matching algorithm node and determine the designated match code.



3. Review the designated match code and verify match code values are displayed on the Match Code Values tab (described at the beginning of this section). If needed, use the 'Maintain Match Code Values' functionality to update match code values and address any missing or invalid values.
4. Right-click the desired matching algorithm node and select 'Generate Events for Matching'.



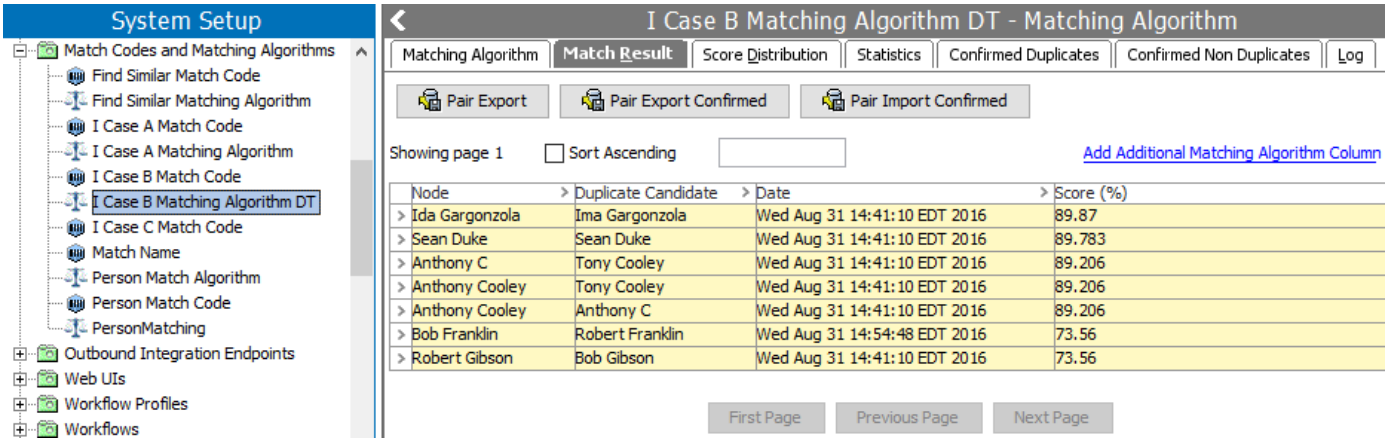
5. Select an existing event processor that is linked to the algorithm.



6. Click **OK** to start the background process which will rematch all objects using the matching algorithm.

Handling Potential Duplicates

Once the matching algorithm has been run, the results can be viewed on the 'Match Result' tab of the matching algorithm.



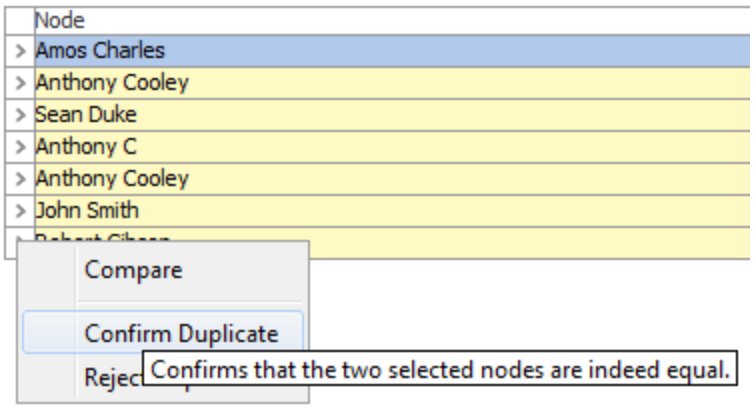
Note that potential duplicates identified via a golden record configuration can also be handled in a workflow. For more information, see the **Clerical Review** section of the **Matching, Linking, and Merging** documentation.

Important: It is recommended that potential duplicates identified through a Match and Merge solution should be handled in Web UI. For more information, see the **Matching and Merging in Web UI** documentation.

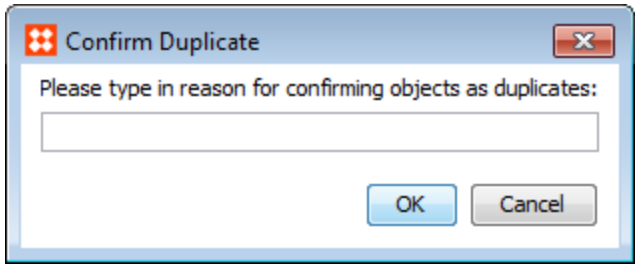
Confirm or Reject Duplicates

From the 'Match Result' tab it is possible to compare pairs and mark them as either confirmed duplicates or confirmed non-duplicates.

1. In **System Setup**, select the relevant matching algorithm, and then click the 'Match Result' tab.
2. Click the row that contains the duplicates you wish to confirm or reject.

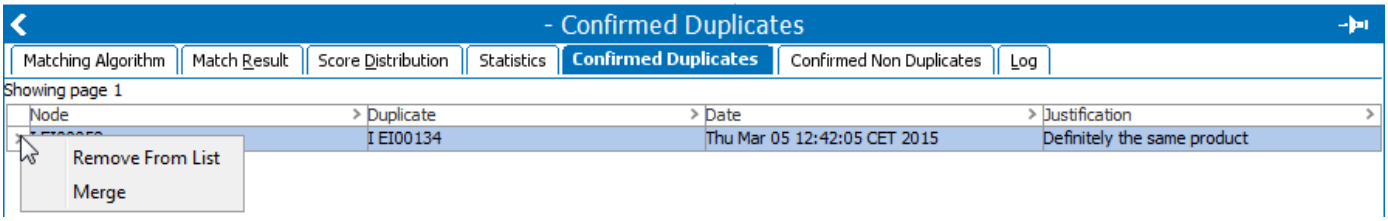


3. Provide a reason for the confirmation / rejection. Click **OK**.

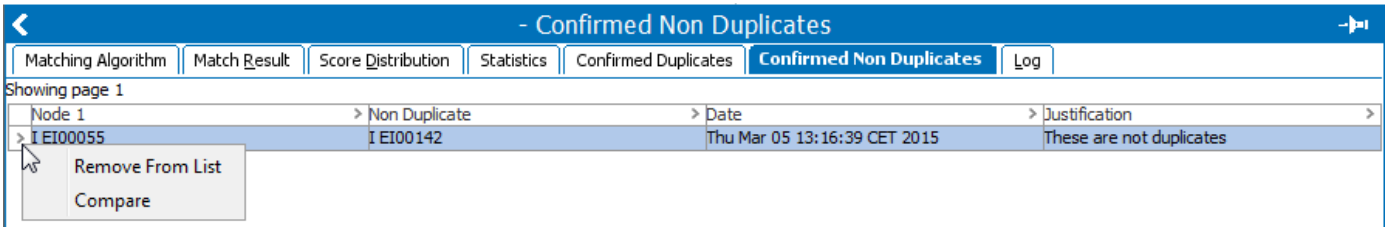


Note: The reason provided is saved as an attribute value on the corresponding Confirm Duplicate/Confirm Non Duplicate reference.

If two objects are confirmed as being duplicates, a reference of the 'Duplicate Type' specified in the component model and in the matching algorithm will be created, the pair will be removed from the 'Match Result' tab, and instead, will show up on the 'Confirmed Duplicates' tab.



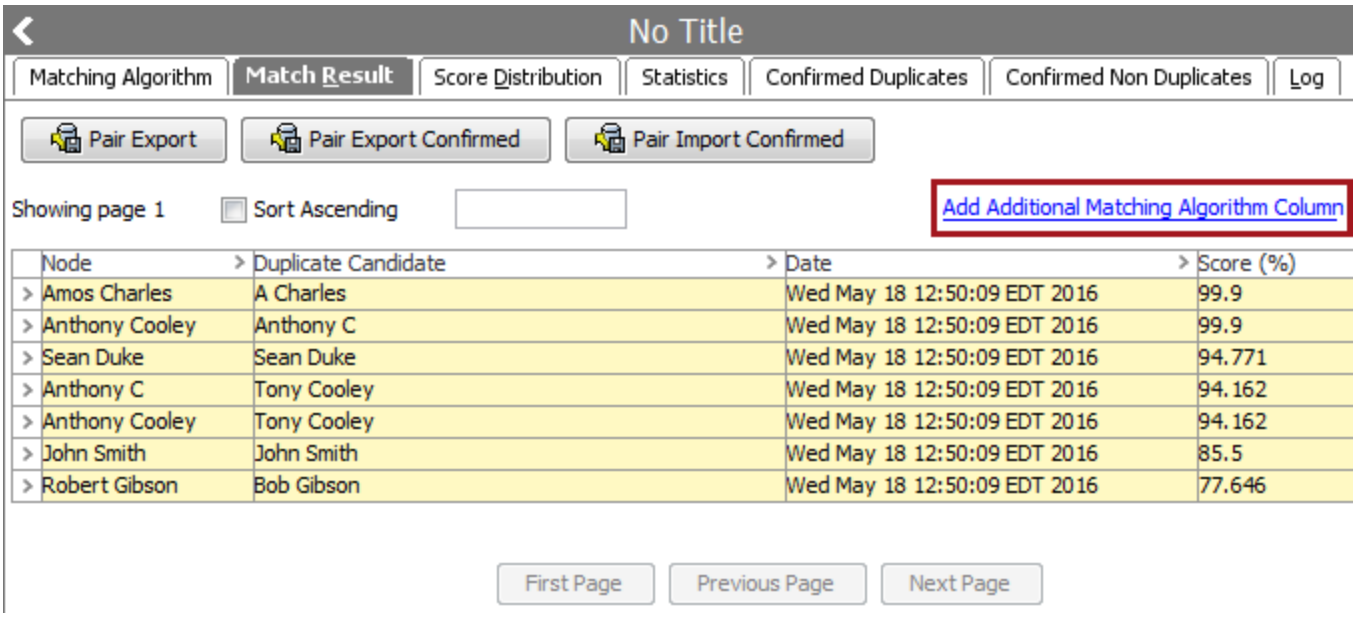
Likewise, if a pair is rejected as being duplicates, a reference of the 'Non Duplicate Type' will be created and the pair will be shown on the 'Confirmed Non Duplicates' tab.



It is important to understand that if a pair has been confirmed as duplicate / non duplicate, the pair will not be considered if the matching algorithm is reapplied, regardless of whether the data on the objects has changed. The confirmed duplicate / non-duplicate relationship can be updated either via the 'Remove From List' options shown above or by deleting the references.

Add Additional Matching Algorithm

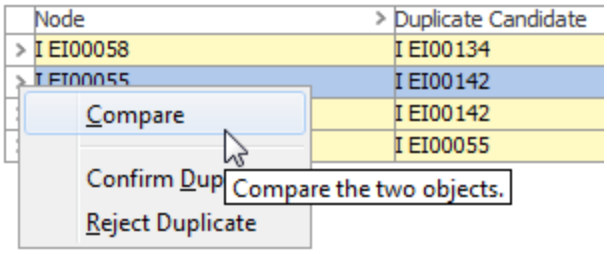
If you need more information about the objects before you decide whether they are duplicates or not, add an additional matching algorithm or compare the objects (described below). An additional algorithm can be added via a link on the 'Match Result' tab.



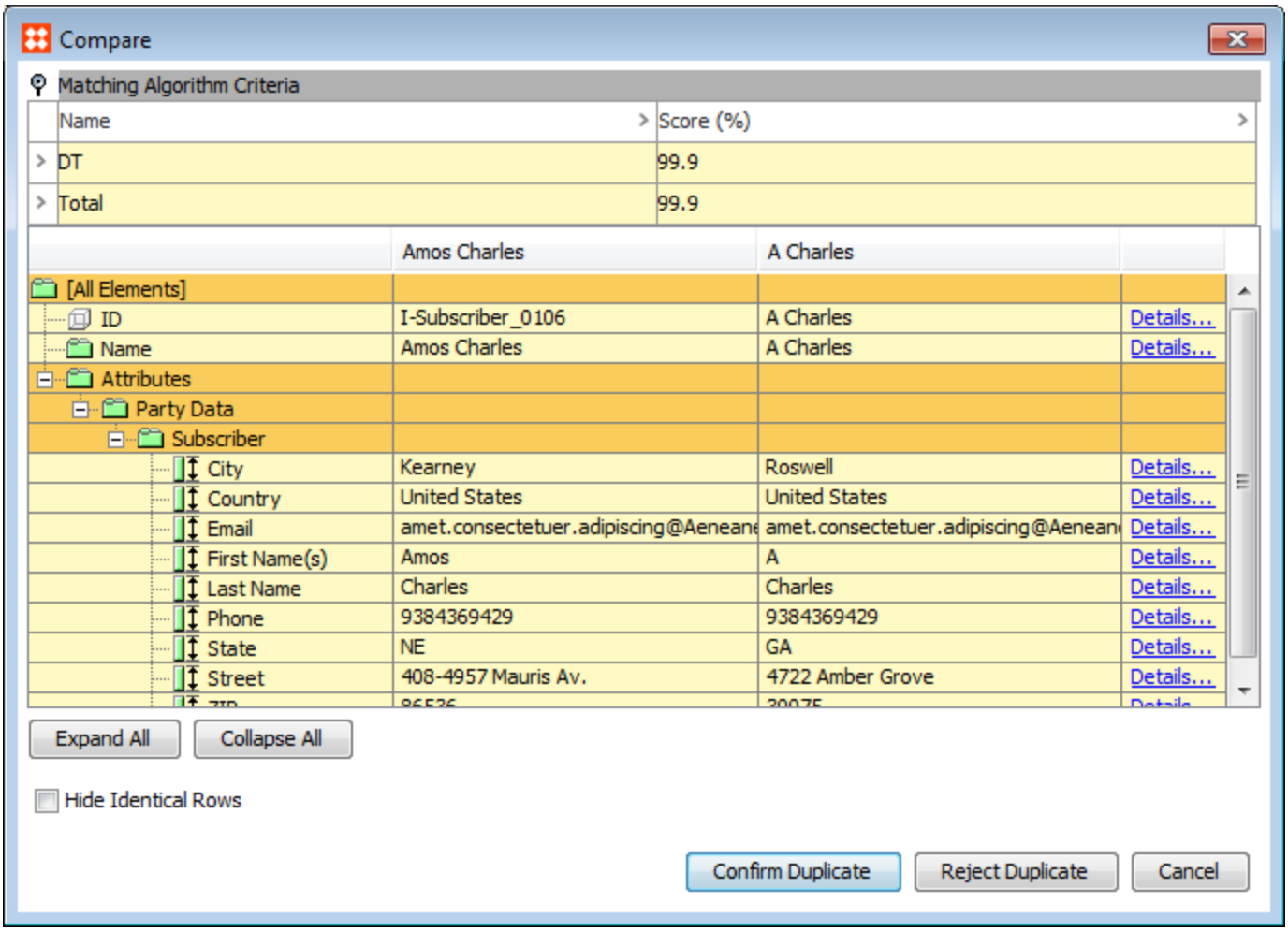
Note: Filters can be applied to the column headers for easy navigation and filtering of desired data.

Compare Matched Objects

To compare a pair of objects, right-click on the applicable row in the 'Match Result' or 'Confirmed Non Duplicates' tab and select the 'Compare' option.



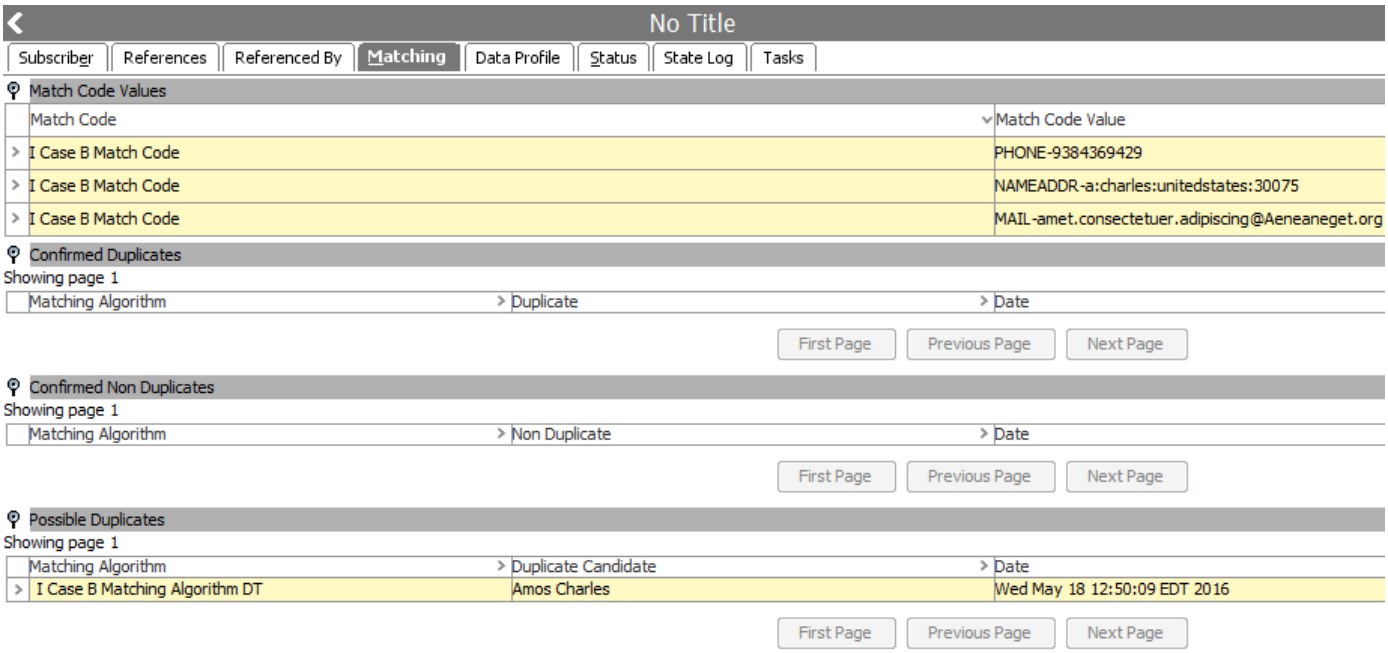
The 'Compare' screen can be used to review the similarities and differences between the paired objects. When accessed via the 'Match Result' you can confirm or reject duplicates via the **Confirm Duplicate** and **Reject Duplicate** buttons.



View Matched Objects in Tree

Duplicate information can also be viewed on objects in the Tree.

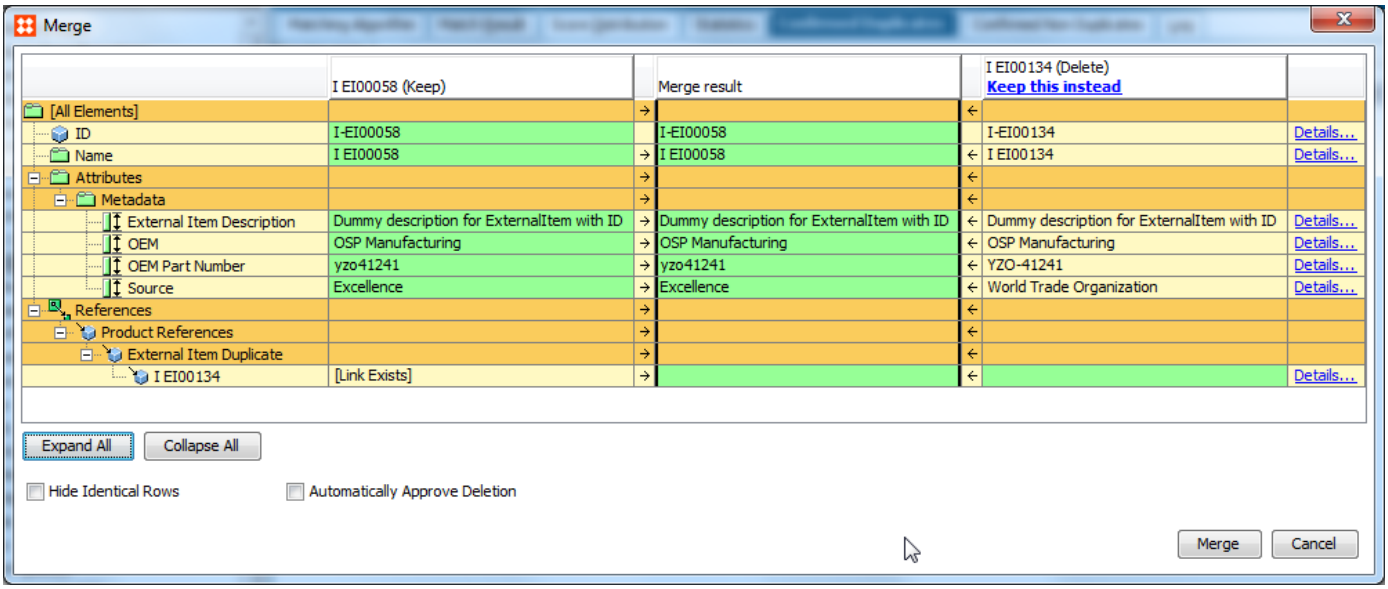
In **Tree**, select the relevant object, and then click the 'Matching' tab. Alternatively, you can access this information by clicking the link of the object if it is listed in the **Match Result** tab.



Merging Confirmed Duplicates

From the 'Confirmed Duplicates' tab, apart from removing a pair, it is also possible to merge a pair into a single record. If this option is selected, then a dialog like the one shown below will open. You can decide which object to keep, and manually merge data from the object you choose to delete and the one you wish to keep.

Important: Because duplicate source records are deleted during a merge this should not be used as part of a Golden Record solution.



If the object that remains does not contain any data in any context, the data is taken from the deleted object and merged into the remaining object.

Data is defined as:

- Attributes
- Object name
- Reference types
- Object to classification link types
- Table types
- Object to attribute links

There is no accumulation for reference and link types. If the reference or link type is already populated in any context nothing is merged from the object that is deleted.

The five columns show the data type, the object to be kept, the result of the merge, the object to be deleted, and a details link used to inspect differences between the data on the objects.

- To keep the object that is currently set to be deleted, and instead delete the other object, click **Keep this instead** in the header of the 'Delete' column.
- Select 'Hide Identical Rows' to toggle between hiding and showing rows where the duplicate pairs contain the same data.
- Select 'Automatically Approve Deletion' to automatically approve that the deletion of objects in the 'Delete' column during the merge process.

The green cell background color indicates where data is taken from.

During the merge process, all references to the deleted object are modified to point to the object that remains in the database. This means that the source objects will be modified. If you select 'Automatically Approve Deletion', only the deletion of the objects is approved. Changes to objects because of references that are pointed to another target are not approved.

For more information about how to merge confirmed matches via Web UI, see the **Merging Confirmed Matches** section of the **Web UI** documentation.

Matching and Merging in Web UI

The Matching and Merging solution is supplemented by a number of useful Web UI components that assist in clerical reviews for potential duplicates, as well as help track golden record revisions and source system / record information.

The Match and Merge Web UI components include:

- Golden Record Source Information
- Golden Record Source Traceability Screen
- Golden Record Clerical Review Task List

The Corner Bar Search and Homepage Search widgets can also be used to search for golden records via golden record or source record ID. For more information on these widgets, see the **Corner Bar Search Component** or **Homepage Widgets** sections of the **Web User Interfaces** documentation. Details on how to add a widget to a homepage can be found in the **Adding Widgets to a Homepage** topic in the **Getting Started** documentation.

Golden Record Source Information

The 'Golden Record Source Information' component is configurable on a node details screen for an entity, and displays source record information including:

- Source Record, which displays the ID of the source record.
- Source System, which displays the name of the source system from which the record originated.
- Created, which displays the date the source record was created.
- Last Updated, which displays the date the source record was last updated.

Source Records

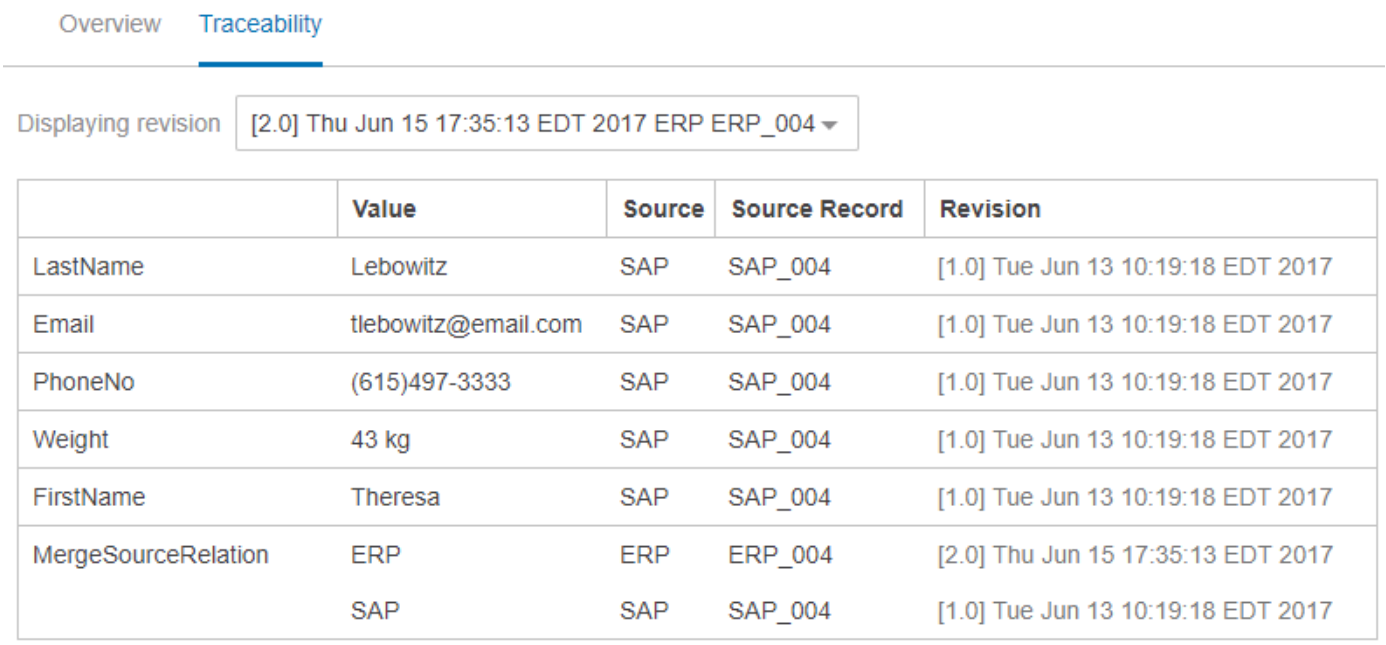
Source Record	Source System	Created	Last Updated
ERP_004	ERP	6/15/2017	6/15/2017
SAP_004	SAP	6/13/2017	6/13/2017

This component offers a general overview of the golden record's history and from which systems it has received data. Once added as a child component on a node details screen, no further configuration is required.

For more information, see the **Node Details Screen** section of the **Web User Interfaces** documentation.

Golden Record Source Traceability Screen

The 'Golden Record Source Traceability Screen' offers a more comprehensive look at a golden record's revision history than the 'Golden Record Source Information' component, and can be configured with header rows that display the values of attributes, attribute groups, data container attributes, and reference types. This allows the user to track changes to individual aspects of a golden record, and displays from which system the new values originated, and when the changes were made.

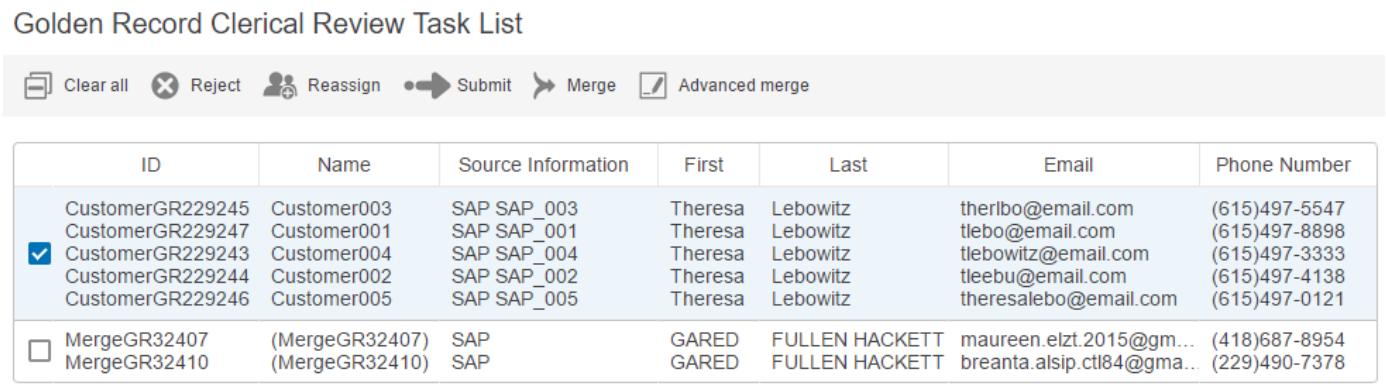


	Value	Source	Source Record	Revision
LastName	Lebowitz	SAP	SAP_004	[1.0] Tue Jun 13 10:19:18 EDT 2017
Email	tlebowitz@email.com	SAP	SAP_004	[1.0] Tue Jun 13 10:19:18 EDT 2017
PhoneNo	(615)497-3333	SAP	SAP_004	[1.0] Tue Jun 13 10:19:18 EDT 2017
Weight	43 kg	SAP	SAP_004	[1.0] Tue Jun 13 10:19:18 EDT 2017
FirstName	Theresa	SAP	SAP_004	[1.0] Tue Jun 13 10:19:18 EDT 2017
MergeSourceRelation	ERP	ERP	ERP_004	[2.0] Thu Jun 15 17:35:13 EDT 2017
	SAP	SAP	SAP_004	[1.0] Tue Jun 13 10:19:18 EDT 2017

For more information, see the **Golden Record Source Traceability Screen** section of the **Web User Interfaces** documentation.

Golden Record Clerical Review Task List

The 'Golden Record Clerical Review Task List' screen is accessible via a status selector home page widget, and displays all potential duplicates found in a specific golden record clerical review workflow. From this screen, golden records are grouped into tasks and can be rejected as duplicates or acknowledged as duplicates and merged together. These tasks can also be reassigned to other users or submitted to another state in the workflow.



For more information, see the **Golden Record Clerical Review Task List** section of the **Web User Interfaces** documentation.

Match and Merge Web Service Type

The STEP Match And Merge Web Service Endpoint allows users to send data and receive a response. The request sent to this service will include information such as:

- User name and password for access validation.
- A reference to a STEP context. For more on this, see the Business Condition and Context section in this topic.
- A reference to a Web Service Endpoint configured with the STEP Match And Merge Type. For more information, see the Configuring a Match and Merge Web Service Endpoint section in this topic.
- Entity representations of each record to be imported. Any non-duplicates can be declared via the Non-Duplicate Reference Types, as defined by the Matching Component model.

When the request has been received all incoming records will go through the following process.

1. **Validation** - In this step, the web service type validates incoming data to ensure it satisfies any minimum data requirements, e.g. record has an address or a last name. Records that are not successfully validated will not be stored in STEP and will be rejected.
2. **Standardization** - In this step, incoming data may be standardized, e.g. address standardization.
3. **Matching** In this step, any existing matching or potentially matching records are identified. The outcome will be either:

- new or updated golden records in STEP
- a rejection from the service

  In all cases, the web service's response will note:

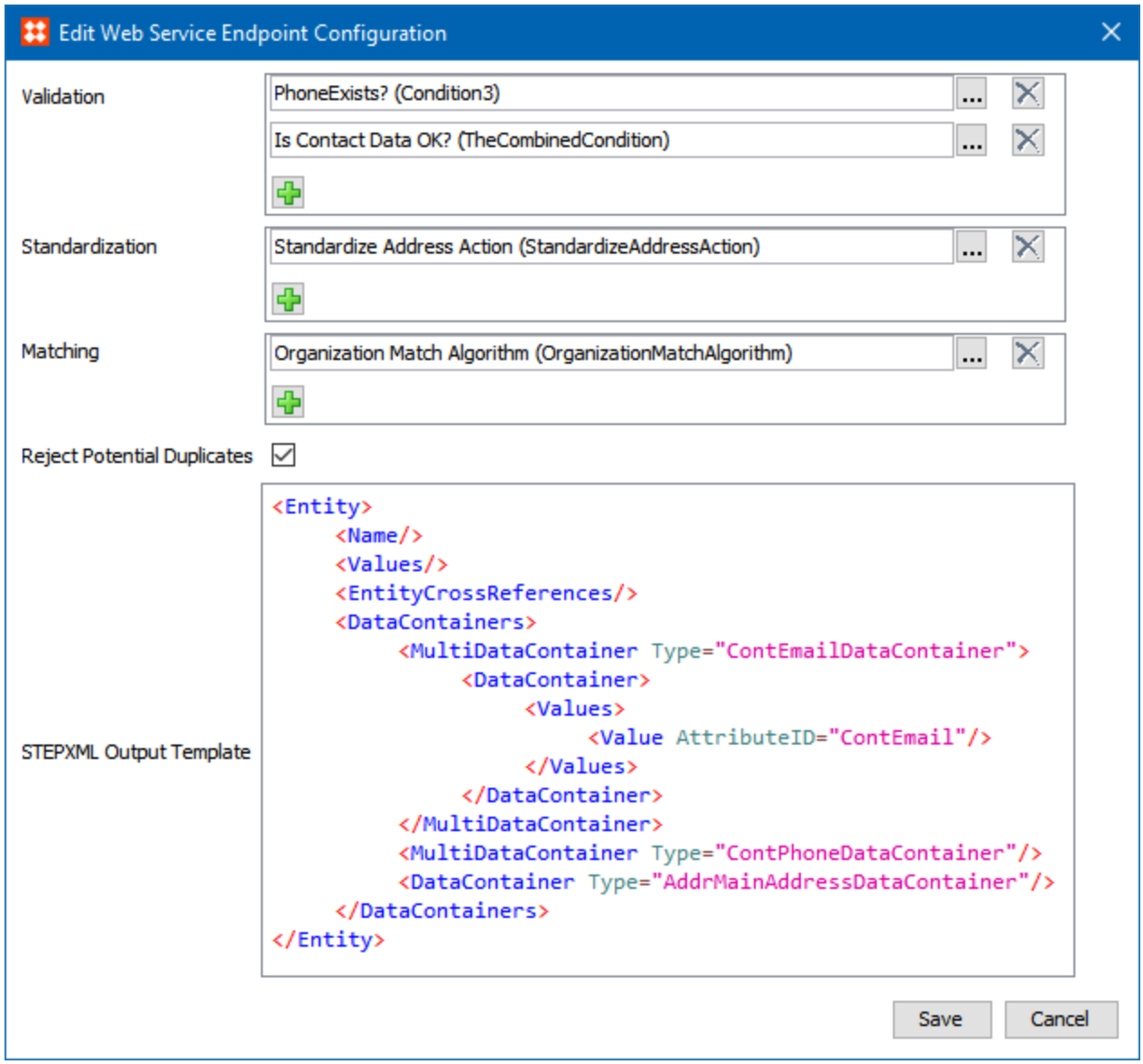
- if the incoming record was validated
- any potential duplicates that are found
- information on the new / updated record itself
- if the record will be handled manually in a clerical review

The exact behavior of a Match and Merge Web Service Endpoint depends on the endpoint configuration.

For more information on Web Service Endpoints, see the **Web Service Endpoint** topic in the **Data Exchange** documentation. More information on this web service type can be found in the STEP API documentation at [system]/sdk or by clicking the **STEP API Documentation** button on the STEP Start Page. For information on how to navigate to the Advanced STEPXML output template, see the **Advanced STEPXML Format** topic in the **Data Exchange** documentation.

Configuring a Match and Merge Web Service Endpoint

With a new blank Web Service Endpoint, select the 'Edit Web Service Endpoint Configuration' link below the fields. In the 'Edit Web Service Endpoint Configuration' dialog, the following items can be specified as desired:



For each of the following items, selecting the green plus will create a new entry for each section:

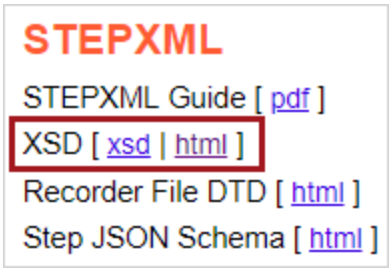
To configure each criteria, click the ellipsis button (...) . This action opens a selection dialog box, limited by each field. The X button ( ) deletes the criteria. Each section does the following to the Web Service Endpoint:

- **Validation** - This field is constrained by business conditions that will limit what data is matched. If the data does not conform to any validation criteria denoted, it will reject the record. These operations will result in true or false. For more information, see the **Business Condition** topic in the **Business Rules** documentation.

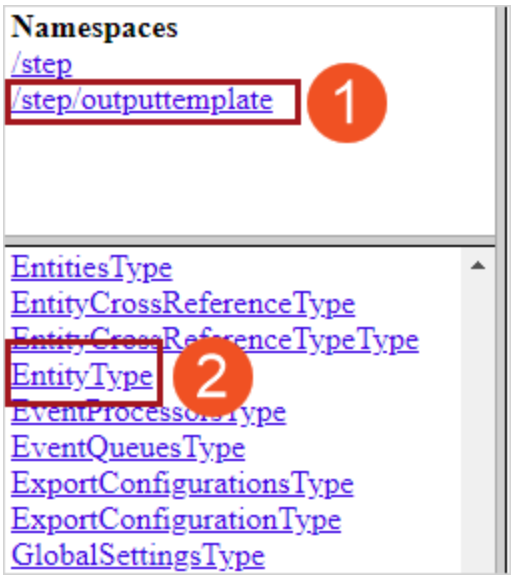
- **Standardization** - This field is constrained by business actions that make the data being matched conform to a set standard format. For more information, see the **Business Actions** topic in the **Business Rules** documentation.
- **Matching** - This field is where a matching algorithm is set for the records that will be compared. In cases with different object types, there may be multiple matching algorithms. For more information, see the **Matching Algorithm** topic in the **Matching, Linking, and Merging** documentation.
- **Reject Potential Duplicates** - This option, if selected, will automatically reject potentially duplicated records. This means that if a record is imported into this Web Service, and if the matching algorithm finds any similar records that would lead to the creation of a clerical review task, it will just reject the record creation.
- **STEPXML Output Template** - The output template is an Advanced STEPXML structure that will populate and filter the STEP data in the response. The output template is based on Advanced STEPXML. The highest level tag in the output template should be the <Entity> tag. For example:

```
<Entity>
    <Name/>
    <Values>
        <Value AttributeID="IndLastName"/>
        <Value AttributeID="IndFirstName"/>
    </Values>
    <DataContainers>
        <MultiDataContainer Type="ContEmailDataContainer"/>
        <DataContainer Type="AddrMainAddressDataContainer"/>
    </DataContainers>
</Entity>
```

The XML template must contain a 'ComplexType EntityType' as defined in the STEPXML XSD. This output template is available in the STEP SDK and API documentation from [server]/sdk or by clicking the STEP API Documentation button on the STEP Start Page. It is located under the STEPXML section of this documentation.



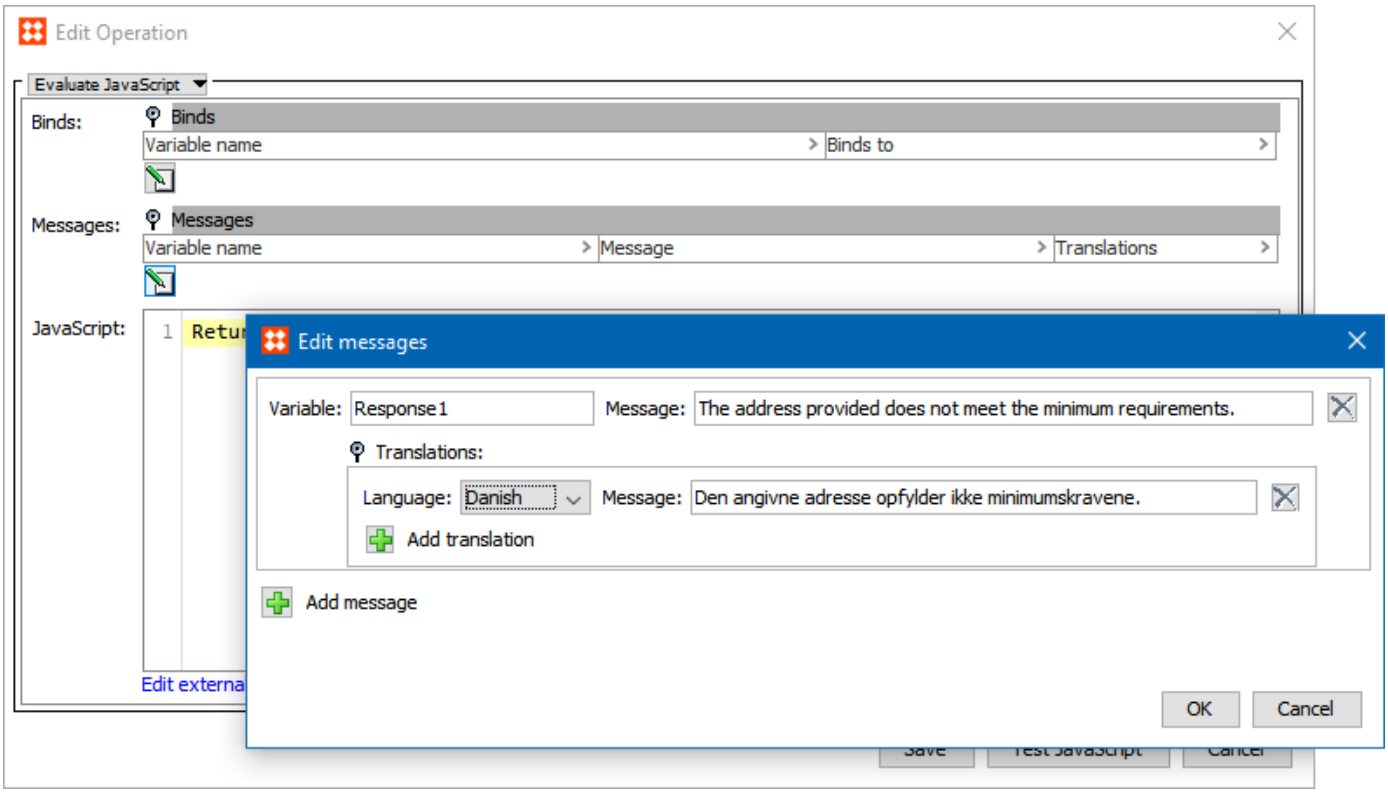
Under the /step/outputtemplate namespace, select the EntityType line.



For more information on the Advanced STEP XML use, see the **STEPXML Tags and Examples** topic in the **Data Exchange** documentation.

Business Conditions and Contexts with Matching and Merging Web Service Type

When sending a Web Service request, the request will include the current context. This request is sent to STEP, and STEP returns a value with the context language included. Should the 'Evaluate JavaScript Business Condition' fail, then the included context will signal which translation of the business condition message to include.



For more information, see the **Business Condition: Evaluate JavaScript** topic in the **Business Rules** documentation.

Match Tuning

A Match Tuning configuration allows data stewards to evaluate and fine-tune a matching algorithm for better accuracy when importing source records. With this tool, users can analyze data and iterate on the matching algorithm *before* ever running an import.

The first step in fine-tuning the algorithm is to run a STEP data profile on files mapped to the match tuning configuration. The match tuning configuration utilizes standard data profiling tools, but because the data being profiled originates from outside the system, some features such, as bulk update, search, and saving collections, are not available.

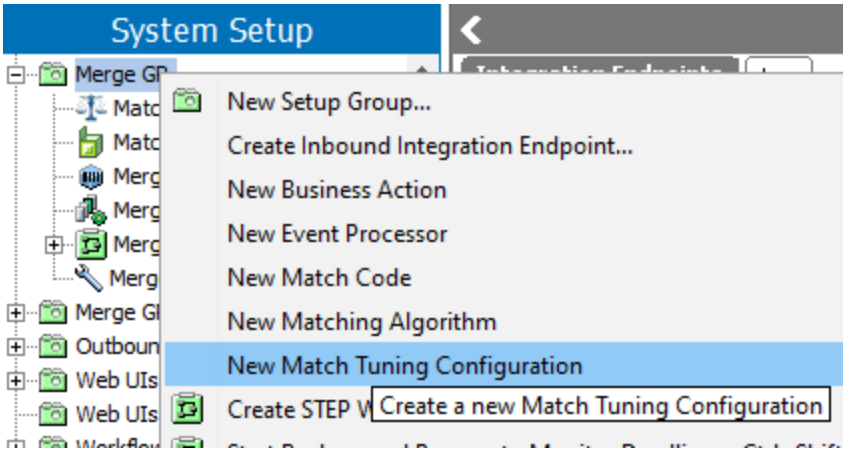
Next, the match tuning configuration can evaluate the matching algorithm via the 'Evaluate Matching Algorithm' action. This action runs two reports (pair export and match codes export) in a background process that can assist the data steward in evaluating the data by showing which match code groups have been created and which source records have been matched together, based on the data profile.

Using these reports, the data steward can continue to iterate on the matching algorithm until it is satisfactory.

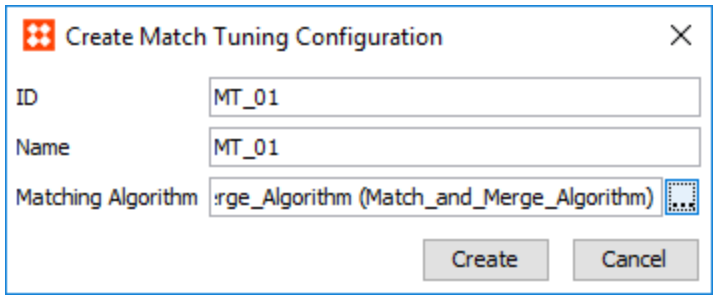
Creating a Match Tuning Configuration

Before a Match Tuning configuration can be created, ensure that the basic object type for Match Tuning configurations under System Setup > Object Types & Structures, has been made valid for a relevant setup group.

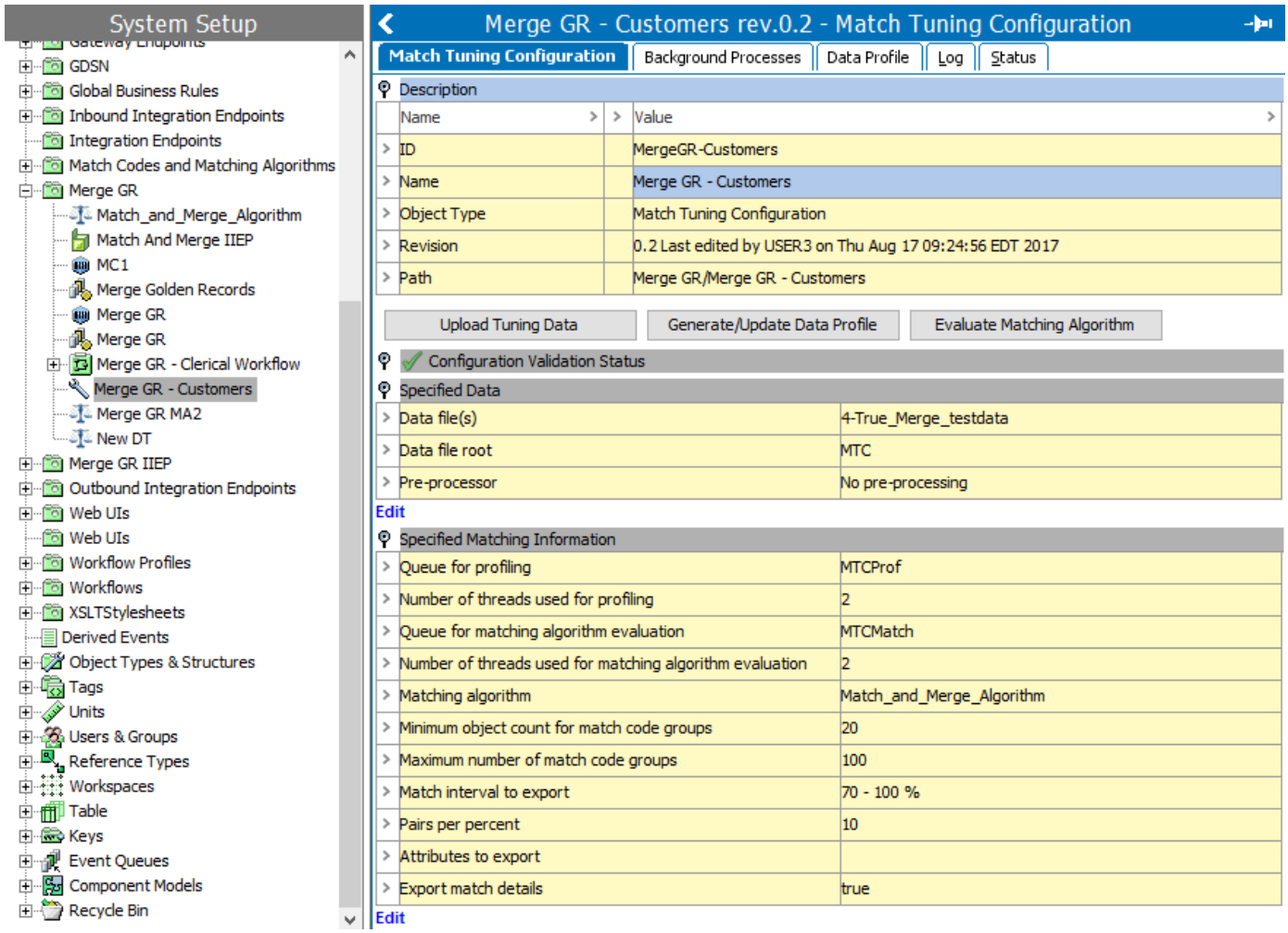
1. In **System Setup**, right-click the node configured to house matching tuning configurations and select 'New Match Tuning Configuration.'



2. In the 'Create Match Tuning Configuration' dialog, define an ID and name for the configuration, and specify a matching algorithm to test, then click **Create**.



3. Click on the 'Match Tuning Configuration' tab to view the overall configuration.



4. In the 'Configuration Validation Status' flipper, a check mark will appear if the configuration is valid. If it is not, an X will appear and error information will be provided.
5. Before tuning data can be profiled, an asset object type must be created to store the data. Additionally, this asset object type must be mapped to the 'Match Tuning Asset Object Type' parameter in the Matching - Merge Golden Record component model.

For more information, see the **Matching, Linking, and Merging Component Model Configuration** section of the documentation.

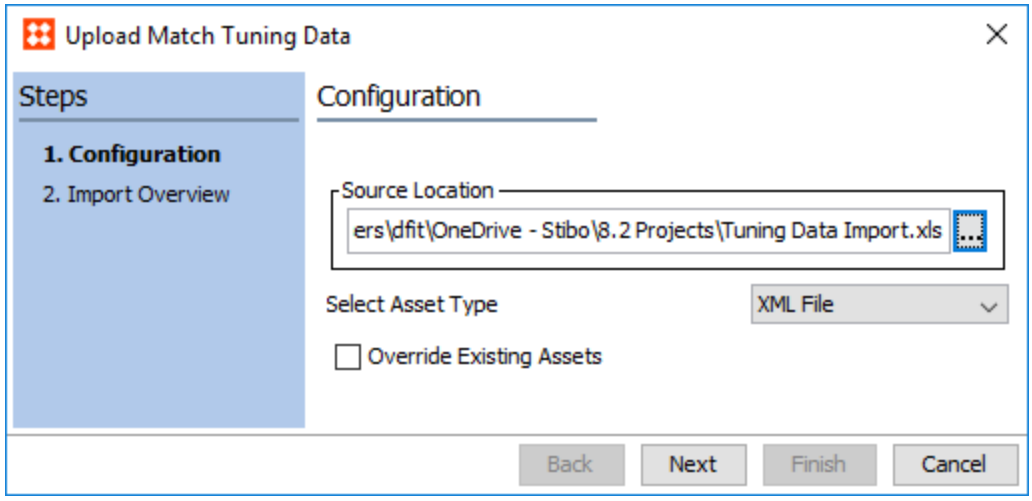
A root file must also be configured to store the tuning data. Navigate to the 'Specified Data' flipper on the 'Match Tuning Configuration' tab, and click **Edit**. In the 'Specified Data' dialog, under the 'Data file root' parameter, click the ellipsis button (...) to specify the root file where the tuning data is stored. For more information on this dialog, see Step 7 below.

Important: This asset object type must have its Reference Target Lock Policy parameter set to 'Strict'. For more information on this parameter, see the **Reference Target Lock Policy on Object Types** section of the **Data Exchange** documentation.

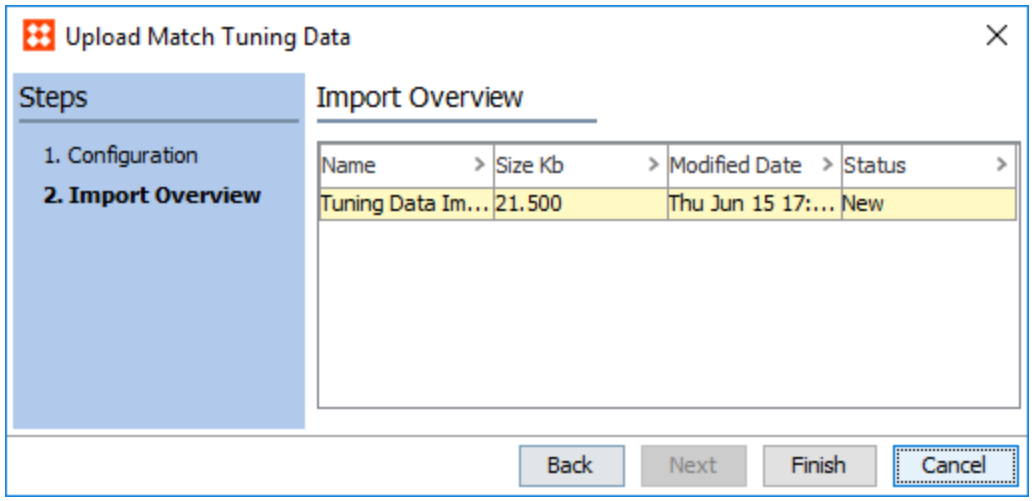
---

6. Once an asset object type has been established, tuning data can be uploaded. To do so, click the **Upload Tuning Data** button on the 'Match Tuning Configuration' tab. In the wizard that appears, navigate to the 'Source Location' parameter and click the ellipsis button (...) to specify a data file.

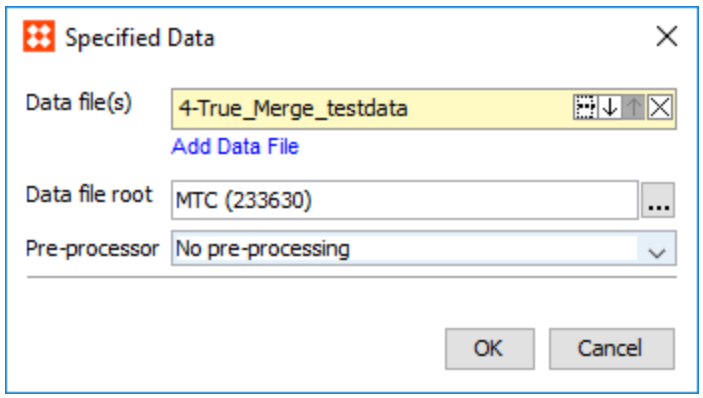
   In the 'Select Asset Type' parameter, specify the desired asset type among those configured in the previous step. Check the 'Override Existing Assets' box if previously uploaded tuning data should be overwritten.



   If desired, click **Next** to view the Import Overview, then click **Finish** to upload the tuning data.

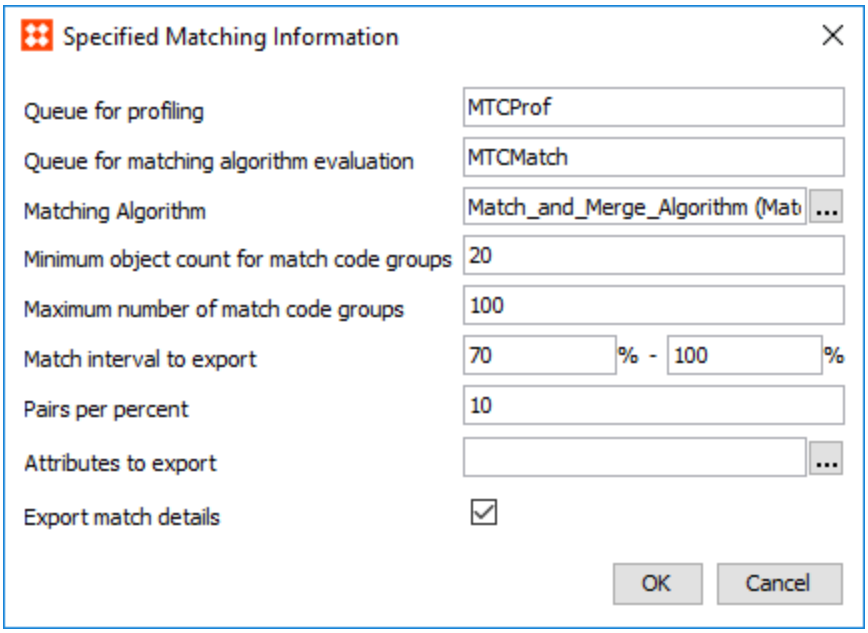


7. To specify tuning data to profile, navigate to the 'Specified Data' flipper and click **Edit**. Click the **Add Data File** link and select a data file(s) among those uploaded in the previous step (and which resides under the specified root). If the file is not a STEPXML, a pre-processor can be used to convert the data.



For more information on converting the CSV / Excel files in this way, see the **IIEP - Configure Match and Merge Import Processing Engine** section of the **Data Exchange** documentation.

8. Before generating the data profile, the Data Profile tab should be configured. For more information on configuring a data profile, see the **Data Profiles** section of the **Data Profiling** documentation.
9. Click the **Generate/Update Data Profile** button on the **Match Tuning Configuration** tab in order to generate the data profile.
10. To specify matching algorithm details, navigate to the 'Specified Matching Information' flipper and click **Edit**. In the 'Specified Matching Information' dialog, fill out the relevant parameters:



- **Queue for profiling -** The background process queue created for profiling.
- **Queue for matching algorithm evaluation -** The background process queue created for matching algorithm evaluation.
- **Matching Algorithm -** Click the ellipsis button (...) and browse or search for the matching algorithm the match tuning configuration should test.
- **Minimum object count for match code groups -** Enter the minimum number of objects to be exported per match code group.
- **Maximum number of match code groups -** Enter the maximum amount of match code groups the tuning data can generate.
- **Match interval to export -** Specify an interval that includes pairs expected to be both matches and non-matches, as well as pairs that are not clear matches or non-matches. Only pairs with scores within this interval are exported.
- **Pairs per percent -** Enter the maximum number of pairs to be exported for each percentage point.
- **Attribute to export -** Click the ellipsis button (...) and select the attribute values that should be exported.
- **Export match details -** Check the box to add additional columns with part scores from decision table comparators and sub decision tables.

For additional information on some of these parameters, see the **Adjusting a Matching Algorithm** documentation.

11. Once 'Specified Matching Information' has been configured, click the **Evaluate Matching Algorithm** button on the 'Match Tuning Configuration' tab. This will start a background process that creates a pair export file and match codes export file.